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EDITORIAL.

THE REPORT of the government mining engineer exhibits the fact that the mines of the Transvaal required stores and machinery to the value of over $45,000,000 in one fiscal year. For timber, $2,500,000 was spent; for cyanide, one-half as much. The salaries and wages aggregated $30,000,000; about $4,000,000 went to salaries, $20,000,000 to white workmen and $6,000,000 to colored laborers.

ON ANOTHER PAGE we publish a valuable note from Mr. F. W. Sperr, professor of mining to the Michigan College of Mines. It deals with 'bursting' pillars and the allied subject of 'explosive' rock, recently discussed in our columns by the Chief Inspector of Mines in New South Wales. 'Air-blasts' constitute part of the same problem. In a letter to us Mr. Sperr says: "This is a vital question in many mines at the present time, and erroneous notions are held in regard to it. I should like to see a general discussion of the subject follow. It might lead to important improvements in methods of mining." This view we share, and to that end we invite discussion from engineers interested in the matter. It is of direct practical importance.

THE ARTICLES on ore deposits by Mr. James Park, professor of geology to the School of Mines, at Otago, New Zealand, will be appreciated by busy men. Mr. Park has digested the literature of the subject, and now offers a summary of authoritative theories in such a manner as to render it readily assimilated by those engaged in mining. Ore deposition is a subject which owes much to American geologists, at least in its application to practical mining. It is true that Von Cotta, Posepny, Stelzner, Vogt and other European scientists elaborated many of the principles now generally accepted; and it may be, as some of our friends in Germany view the matter, that American mining geologists have got a bit out of hand, of late, with a certain rashness of theory provocative of ridicule. In any event, protesting against any such hypercritical assumption, we claim that the actual utilization of geological science to mine exploitation is gloriously American; and we rate as highly as any enunciation of principles, the studies of structural geology and ore contacts which have been contributed during the last twenty years by the

gentlemen on this side of the water. To this store of useful knowledge, a number of Australian geologists have given their quota; several of them have been diligent students alike of books and of Nature; to Ulrich, David, Pittman, Dunn, and Don, for example, we owe many clarifying observations; and now Mr. James Park has given us a review which will not merely mark time, but will provoke new consideration of a subject, the interest of which is wide as mining activity.

THE APPEAL for further data on ore-dressing practice, which Mr. E. H. Garthwaite makes in our 'Discussion' columns, will, we trust, find response among millmen and metallurgists. He makes his request for information in specific terms, and undoubtedly he voices the want which many earnest men feel at this time. This call from the interior of Africa ought not to go unheeded; we commend it to the kindly consideration of our professional men.

THE ABILITY of certain subjects to stimulate fresh opinions based upon live practice is well illustrated in another column of this issue. Mr. Hixon's vigorous contribution to discussion brings out the view that pyrite smelting is not a distinct process, except "under certain peculiar conditions which are purely local"; but rather that it is a phase or degree which is comparable with, or adaptable to, almost any mode of copper or lead smelting. Thus the oxidizing effect may be produced both by more blast and also by careful placing of the fine in the center and the coarse at the sides of the furnace; and this without any variation in the average composition of the charge as a whole. The same principle of matte—oxidation, or bessemerization—is illustrated by opposites; a reducing effect may be obtained and controlled, in lead smelting, by the reversed feeding of fine to the sides and coarse to the center. These aspects of smelting practice are well worth pondering; but our contributor scores another point in his addition to the definition of that which constitutes pyrite smelting. He adduces the conception that when the iron in the slag is 'peroxidized' (or rather oxidized to the ferric state) so that magnetite begins to appear in the slag, and well-chilled samples will not yield clean silica on treatment with acid, then the stage of 'pyrite smelting' has been reached. We doubt whether this view will find unanimous acceptance by other leading practitioners of this branch of smelting, but we do not doubt that the abundant occurrence of the salt-oxide, magnetite, is a phenomenon the significance of which has been neglected. It indicates excessive oxidation in general, and a refractory obstacle in particular.

"BEWARE OF the unexpected; it is the improbable that happens." This motto used to be painted on the walls of an old New England school of engineering. The converging of varying factors into one definite result, often malignant, sometimes benign, is illustrated in the natural history of accidents. We know of a case where a man fell into one of the large stock-bins at a huge Western smelter, and, owing to prompt action of the foreman, came through with the ore, and came through alive. All engineers of any experience can parallel this with dozens of anecdotes of accident with a fortunate sequel; but of the whole list, few could match—in novelty, at least—the experience of the workman who was recently blown unharmed through the roof of the New York-Brooklyn subway tunnel by a compressed-air leak, up through the bottom of East river, in a dramatic geyser of aerated mud and water, to be promptly rescued by a policeman who was at hand as though in waiting. This sounds like a tale of Jules Verne, but it is only a bit of actual commonplace; the humor of it is that it befalls not always the clairvoyant nor the theosophist, but the engineer.

A Useful Gift.

We learn with pleasure that Mr. John Hays Hammond has given $5,000 to establish a mining and metallurgical library at San Francisco. The State Mining Bureau, in the Union Ferry Building, at the foot of Market street, San Francisco, already possesses an extensive library, but, through lack of funds, it has not been possible to add new books during the past eight or ten years. A technical library ten years old is useless. It is the desire of Mr. Hammond to place the new library in the rooms of the Mining Bureau, but as a separate unit. Three trustees are to select and purchase the books, which will be kept for reference purposes only. Our special correspondent, Mr. Charles G. Yale, long identified with the best interests of mining on the Pacific Coast, has been asked to serve as a trustee, and that veteran engineer, Mr. Louis Janin, will co-operate with him. The third trustee will be the State Mineralogist, *ex officio*. The creation of the library will commence forthwith, and it is hoped, not unreasonably, that mining men who happen to be authors will contribute copies of their books to a cause so worthy of their support. A distinctive library of this kind—small, select and up-to-date—will come as a boon to busy professional men, and the donation of it to his native State is a graceful act on the part of the distinguished Californian engineer.

Colorado School of Mines.

There is something at once pathetic and stimulating in the respectful protest, issued by the senior and junior classes of the Colorado School of Mines, against the recently projected annex for "secondary technical education." The attitude taken by these young men is both a loyal defense of their institution and a frank confession that the State income does not provide the equipment necessary for the suitable demonstration of historical and present practice in mining, milling and metallurgy. That the ill-considered proposal for this annex should threaten to terminate in a fiasco is not unexpected, issuing as it does from a board of trustees who are politicians always; and it is eminently proper for the president, who has not had experience in Western mining, but who is a respectable teacher and in most excellent standing, to feel the public pulse. Fortunately the sphygmograph of the senior and junior classes indicates a brain and heart action that are entirely normal. These young men can be trusted. They have worked for their standard, and they know what it is worth. Of the various grades of technical instruction, there is only one which is worth cultivating, and that is the best that a well selected group of enthusiastic specialists can integrate into a discipline that is hard and that takes time. There should be no hesitation as to the proper course for a high-grade technical school. It is true that special students collectively include many of the worst and a few of the best; it is true that these few best should encourage themselves and should be encouraged. But it is not true that the curve of irregularity can serve as a straight-edge, or a drifting buoy as a lighthouse. Standards need no

definition. "The best is good enough"; the saying is a safe guide for all schools in the throes of political trimming.

The Value of a Patent.

Progress in the arts of chemistry and metallurgy has been largely due to inventions that have been patented, although many of the important inventions have been incapable of patent protection, and in the case of not a few which were patentable, the inventors have neglected to make application for protection of their rights. Instances of the latter character were, however, more common in the past than they are at present, when, almost without exception, everyone who conceives a new idea rushes to the Patent Office. It is for this reason that the examiners of that office claim that their files are the best record of progress in the arts, and in that claim they are probably correct.

It is not the purpose of this article to discuss the uselessness of wasting time and money on the great mass of worthless patents that are allowed, inuring only to the revenues of the patent office and the solicitors who prosecute the applications, but to consider the exploitation of the comparatively few inventions that are really useful and have a commercial value. The inventors of such useful improvements will doubtless agree with the assertion that they seldom receive the full money return that they ought, but probably they will be less inclined to agree with the assertion that the fault lies very largely with themselves.

It is no more than human that an inventor should have an exaggerated idea of the value of his invention; that he should dream of selling it for a cash payment that will make his fortune; that he should be suspicious of overtures from promoters. Yet it is precisely that attitude that often causes the inventor to stand in his own light. In other words, it is his lack of commercial instinct. All inventors are not devoid of that instinct by any means, as witness George M. Pullman, George Westinghouse and many others, in whom it was developed to a high degree; but they are the minority. In any case, the invention and its safeguarding by a strong patent are only two steps. The appreciation of its applications, their possible value, the commercial management, the warding off of infringements, and finally the collection of the returns are other steps that are necessary and quite as important as the first two.

The value of a patent depends chiefly upon its earning power; that is, the saving that it can effect over some existing method, or in the utilization of previously useless materials, or in the production of new articles; and upon its scope and legal protection; that is, the breadth of its claims, and their capability of sustainment. Thus a broad, generic patent is vastly more valuable than a narrow, combination patent. Generic patents can now, however, be very rarely obtained.

The ordinary patent, even on an ingenious and apparently valuable invention, is apt to be an intangible and doubtful piece of property, and in general it is difficult to find a customer who will buy it for a round sum in cash. Sometimes it happens that the new invention threatens some existing interest of sufficient magnitude to induce its purchase at a high figure, to eliminate chances of its falling into hands that would create a destructive competition. Sometimes it happens that the safety of a business established on patents of doubtful validity can be protected by the acquisition of threatening patents of an earlier date. But in the case of the new patent, merely offering opportunity to do something a little better than was done previously, jeopardizing no great investments of capital, the entire value depends upon the business which can be created upon its strength, and the promoters have to take the risk of bad management, infringements, and even of nullification of the patent. A patent is not, therefore, a species of property which, in its early stage, will command many cash bids. Promoters may be found who will organize a company to exploit the patent and give the inventor a proportion of the stock in exchange for his rights; or who will undertake the exploitation for a percentage of the royalties, which comes substantially to the same thing; or manufacturers who will build, advertise and sell, paying the inventor a royalty. But he is a lucky inventor who obtains much cash before it has been actually earned.

Good business policy decrees that an inventor should get his invention into use as soon as possible. His right is only a temporal one anyway, and lost time can not be replaced. Many good inventions have lain dormant until only a few years before expiration of their patents. Moreover, the inventor is constantly subject to the risk that some new and improved invention will render his own quite valueless. And finally, if his own invention be only an improvement on some other, it is important to get his into use first, wherever possible, because it is very much easier to compete with a rival in an open field than to displace him from an installation already made. Delay is therefore of grave danger, besides causing loss of time during which money ought to be earned. The inventor should recognize also that the commercial genius which can manage and obtain the maximum benefit from his invention is as much entitled to a share of the proceeds as is his own inventive genius. Unless an inventor be very sure of his own commercial instinct, he will do well to associate with himself a man of business, and he may rely upon it that the quicker and more extensively he can effect the use of his invention, the better will be his chance for selling it eventually for cash.

Market Conditions.

April 12.

The metal markets are steady as a rule, but generally rather quiet. In copper, domestic business is very quiet, but exports continue large. The possibilities of peace in the East and a smaller demand for copper for war material, do not seem to be considered at all. Tin is selling only for immediate necessities. Lead is firm and in good consumptive demand. Spelter is rather stronger, being called for by consumers.

Silver remains dull and low in price, under the influence of light buying for India. At the close, prices improved.

The iron markets are showing rather a lull in buying. Mills and furnaces, however, are all busy on orders. In fact, most of them are well sold up for the second and third quarters of the year. A new development is the appearance of inquiries for material for electric railroads. Apparently a number of new enterprises of this class are developing, and will be in the field for rails and other steel before long. Structural requirements are also increasing.

In the West preparations are being made for the opening of the Lake trade; otherwise the coal markets are rather dull. On the Atlantic seaboard both the bituminous and the anthracite markets are without incident.

Metallics.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

Australia stands first of the countries in the world in the percentage of urban to total population.

By the Bergsoe process (ferric chloride) for the recovery of tin, 40 lb. of the metal is extracted from one ton of tin-plate scrap.

Testing transformers capable of handling 50 kw. at 160,000 volts pressure have been recently constructed by the General Electric Company. Oil insulation is largely used in the design.

One of the big problems of the latest engineering is the ventilation of long tunnels, such as the Simplon.

The apparent volatility of silicon in a Geissler tube in the presence of silicon hydride is due to the alternate formation and decomposition of this hydride as a catalytic; silicon hydride is a gas about as heavy as oxygen.

The radiant power of the hot carbon filament is said to vary directly as the fourth power of its absolute temperature; this is called Stefan's law; its sphere is said to be limited to black substances.

A spectroscopic binary is a double star, the components of which are too close to be separated by direct observation, but which indicate their real separate individuality by an intermittent shifting and doubling of spectrum lines, as shown in photographs which are taken in continuous system, filed and subjected to careful comparison.

Properly roasted zinc ore should contain but little zinc sulphate. Moreover, the subsequent charge should be so made up that the residue shall have slight fluidity, forming a cinder, or at least a thick slag; this is done by giving a high excess of acid (silicious) or basic material.

The list of copper double-cyanides has been recently greatly extended. They are all cuprous compounds, and contain respectively lithium, sodium, potassium, rubidium and caesium, as well as ammonium, calcium, strontium and barium. There are five types, all of which occur among the well-known cuprous double-chlorides.

Telluric acid can be made (according to Gutbier) by dissolving the dioxide in warm caustic soda, oxidizing with 15% hydrogen peroxide, and precipitation by nitric acid.

Tube-Mills.

In his annual report as mining engineer to the government of the Transvaal, Mr. V. P. Swinburne refers to the introduction of tube-mills in three paragraphs, which are worthy of reproduction herewith:

The limited capacity of the Californian stamp, when crushing to the high degree of fineness necessary for the direct extraction of gold by amalgamation and cyaniding, added to its high cost of erection, has been a matter of serious consideration when applied to the equipment of deep-level propositions which will take a number of years to develop, and are required to treat a very large amount of ore to insure a profitable life. In order to increase the amount of ore treated without enormously increasing its capital outlay by the erection of more stamps, it was decided to experiment in the following direction: To crush in the battery with a larger mesh, classify with some form of concentrator, and finally grind the coarse product in a tube-mill. An improvement in extraction is confidently anticipated as the result of the more favorably graded product produced by the tube-mill, and a more general use of this auxiliary grinding machine may be expected.

At the New Goch mine, where it had been the practice to dispose of the concentrate separated by Frue vanners to a chemical works, a tube-mill was installed to grind this concentrate down to a consistence suitable for cyanide treatment. The result has been most satisfactory, and the new practice has shown a decided economic advantage. Mr. H. S. Denny, general manager of the General Mining & Finance Corporation, has stated that the tube-mill has shown its capability to deal with a more varied product than this concentrate, and that it was the intention to abandon the use of the costly 'vanner' and to substitute the 'spitzlutte,' puttting through the tube-mill the whole of the coarse milled product separated by the 'spitzlutte' as not directly suitable for cyanide treatment.

At the Glen Deep, experiments have been conducted by Mr. J. R. Williams, consulting metallurgist to the Rand Mines, Ltd. A tube-mill designed to deal with 50 tons of coarse sand per diem was installed, this tonnage being about the usual proportion of the daily output of the 100-stamp battery with screens of 28 mesh. After two or three days' satisfactory running, an extension of the experiment was decided upon. Ten stamps were set aside, and, of the ore crushed by these, the coarse product separated by the spitzlutten was sent to the tube-mill, the size of the battery box-screen being increased from time to time to ascertain the efficiency of the tube-mill on the varying product, and one side of the tailings wheel and separate launders being specially reserved. After delivery from the spitzlutten and passage through the tube-mill, the pulp was allowed to flow over two amalgamating shaking tables to catch any further gold freed in the grinding process, and was then passed again to the tailing wheel and classifiers. Should any of the sand not have been ground sufficiently fine, it was then automatically returned to the tube-mill. This arrangement worked well, and it was found even at the highest rate experiments that not more than 5% was returned for further grinding. With an increase in the size of the mesh of the battery screen, the duty per stamp was found to rise, and at a rate more than proportionate to the increase in the size of mesh. With a 14-mesh screen the duty averaged 6.5 tons per 24 hours, with 12-mesh screen 7.8, with 10-mesh screen 8.04; while with a screen of 8-mesh 10 tons and upward were crushed, and half of this product was of suitable grade for direct treatment. The tube-wheel meanwhile readily coped with the further supply. Twenty stamps were then allotted with the 8-mesh screen, and still the tube-mill worked satisfactorily, the limit of its capacity apparently not having been reached in these experiments. The rate of feed will no doubt ultimately determine the fineness of the product, but up to the present the maximum capacity of the tube-mill has been increased from 50 tons to 170 tons per diem, not more than 6% of the product failing to pass through a 60-mesh, and there being no large increase in the proportion of slime. It should be stated that with the 20-stamp supply, two more amalgamating tables were fitted.

German Iron Production.

The report of the German Iron & Steel Union shows that the production of pig iron in February was 672,473 tons, being 93,736 tons less than in January. For the two months ending Feb. 28 the production was as follows, in metric tons:

	1904.	1905.	Changes.
Foundry iron.....	295,540	267,936	D. 27,604
Forge iron	134,325	112,783	D. 21,542
Steel pig.	90,690	96,104	I. 5,414
Bessemer pig.	80,490	50,188	D. 30,302
Thomas pig	1,010,468	911,671	D. 98,797
Totals.....	1,611,513	1,438,682	D. 172,831

Steel pig, in the German classification, includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys. This steel pig was the only class showing an increase; in all others there was a falling off. The decrease was 10.8% in Thomas, or basic, pig; and 10.7% in the total output. The smaller production this year was largely due to the strike of the coal miners.

A recent and exhaustive paper in the *Zeitschrift für angewandte Chemie* compares the Lunge and the Silberberger methods for the determination of combined sulphuric acid. It is shown that the Lunge method is, on the whole, equal to the other in results, and superior in time.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

AIR-BLASTS AND EXPLOSIVE ROCK.

The Editor:

Sir—I have read the articles in the JOURNAL on this subject with much interest. In the copper mines of the Lake Superior region, this matter is, as you state, one of much importance. I venture, therefore, to express my views on the causes of 'bursting' pillars in mines and allied phenomena.

All large tabular masses of rock are liable and almost certain to exist under unbalanced stresses. When a portion of such a mass is being detached by mining or quarrying operations, the material often yields before the cut is completed, and more or less of a report usually accompanies the breaking apart. Such occurrences in rock strata close to surface may be wholly due to the unequally supported condition of the weight of the stratum affected. When below surface and varying with depth, similar and more violent actions occur on account of the greater pressures to which the rocks are subjected.

When a mineral lode is excavated, the enclosing walls, if strong, will bend and finally break with the enlargement of the excavation. If pillars of the lode material are left standing, they will fail the same as a cubical block under a testing machine—that is, when the load becomes too great for the strength of the pillar. And the method of yielding of a rock pillar in a mine is like that of the block under the machine. It bursts, to be sure, but we would hardly say that it 'explodes.' The slight vibrations caused by the scratching of a pick, even, may be sufficient to cause the splinters to fly when the rock is on the point of yielding to the pressure upon it. The bursting force is due to external, not internal, circumstances: it is not due to any peculiar chemical, mineralogical or structural composition of the rock, though the strength of the rock has a good deal to do with the manner of bursting.

The disintegration upon exposure to the air is due rather to pressure than to atmospheric influences. This may, however, be a difficult point to prove to anyone not accustomed to conceiving the enormous weight sustained by pillars in a mine; for it is impossible to block out the pillars without exposing them to the air at the same time. It may be confidently stated, however, that rock subject to disintegration by exposure to the air will never exhibit a tendency to burst with much violence.

When the support between two walls suddenly gives way, as by the crushing of pillars, the walls vibrate with greater or less energy, depending upon the force acting upon them and upon their unbroken extent and elasticity. Thus it may happen that the quaking of the earth may be felt most upon either the hanging or foot-wall side. When 'air-blasts' occur in certain copper mines of the Lake Superior district, the resulting vibration is felt most upon the foot-wall side. Does this indicate that the greatest pressure is from that side? And may it not indicate that there is a horizontal thrust now in action upon the great synclinal of the copper-bearing series in this locality?

When the enclosing walls of a lode are weak, the phenomenon known as 'air-blasts' and 'rock explosions' never occurs, for the reason that the walls break in and fill the excavation before the pillars yield. Neither, for obvious reasons, does the phenomenon occur when the pillar material is weak, such as coal and soft ore; but a different kind of air-blast may occur in such cases, as follows: When the hanging wall or roof is strong, it may remain in place until a large area has been excavated from under it. Then, when it does break, it may come altogether and act like an enormous piston to expel the air from the excavation, with the result that the air first rushes out through the drifts and then back again to fill the vacuum, in much the same manner as when an explosion of gas occurs. Such accidents are sometimes attributed to "unaccountable explosions of gas in non-gaseous mines."

All pillar methods of mining are bound to become troublesome if the mine ever becomes large enough or deep enough, or lasts long enough, for the pillars to take the weight of the overlying burden. In coal mining the problem has been satisfactorily solved either by long-wall without pillars, or by driving up the rooms and drawing the pillars quickly before the weight has time to act upon them. Some progress has been made in this direction in ore mines, but the practice of leaving pillars of ore for attempted permanent support is still quite prevalent, with troublesome consequences already developed in some cases and pretty sure to follow in others.

F. W. SPERR.

Houghton, April 7, 1905.

CONTINUOUS SLIME-FILTERING.

The Editor:

Sir—I note with interest what you say in a recent number of this JOURNAL in regard to slime filters, but I do not see that a continuously operating filter is necessary, or in some cases advisable.

Where it takes an appreciable time to get the gold all in solution, as it does with our slime, I consider an entirely continuous process as impracticable; for, while the average time of agitation or exposure of the slime may be the time necessary to bring the gold in solution, yet a portion of the charge may be treated too long, and some of it too little.

If you have to separate the product of slime as it comes from the settler into lots to complete the solution of the gold, I see no objection to the recovery of the gold-bearing solution by an intermittent process also, providing the units are not too large.

The idea of being able to feed in ore continuously at one end of the mill and have slime-tailing flow out continuously at the other is attractive, but lacks flexibility; if anything stops, the whole mill is down. Here we run the grinding department of the mill for 12 hours with the Moore process shut down; and, conversely, we run the Moore process with the grinding end down for renewals.

J. V. N. DORR.

Terry, S. D., March 20, 1905.

EXPLOSIVE ROCK.

The Editor:

Sir—The recent paper by J. B. Jaquet on the 'kicking ground' in the shale of New South Wales mines offers an attractive opportunity to exchange views on the subject. The facts summoned in explanation of the phenomenon are all helpful; some of them, like the Prince-Rupert-drop theory, may not explain how these rocks came to hold this tension through the annealing influence of ages; yet this same theory, as quoted by mine superintendents, does illustrate the sudden pulverizing mode of the explosion. Mr. Jaquet adopts the rational view that the walls are in a condition of strain, and he adduces the brittle consistence of the highly jointed shale as a probable accessory condition. That there is a strain inherent in all country rock is shown by the classic example of the granite slab at the Monson (Mass.) quarry. This slab was 'pegged' out, and lay free fully over 100 ft. in length. It was noticed that, as soon as it was released from live contact with the mother ledge, it stretched in length so that it overlapped by several inches the cavity from which it had just been removed. It is also possible that there are other strains temporarily induced in vein and side-wall rock by the removal of ore, as Mr. Jaquet argues. But if the phenomenon has been correctly described, there is more to the local explosiveness than has been supposed. Many rocks contain included gas under great pressure; and the quantity of gas set free in such a local explosion might entirely escape detection unless special search were made for it. There used to be on the Hampshire hills of the Connecticut valley certain erratic boulders of white quartz. These responded to a sharp blow of a hammer by throwing off, explosively, flaky chips, attended with a most unpleasant odor. The gas, whether composed essentially of hydro-carbons or of carbon di-oxide, would in all probability have escaped detection had it not been attended by some small quantity of fetid matter. In view of the fact that many rocks, in thin sections, show the presence of abund-

ant cavities of inclusion, and the fact that this high gas tension would contribute in no small degree to the activity of explosive phenomena, it might be advisable to subject some of the fresh and not yet 'winded' rock of the 'kicking zone' of the New Hillgrove Proprietary to careful chemical and petrographic examination. There are many incidental bits of evidence which point to the view that both mass strain and molecular strain combine to produce the explosive effect of these Australian mines, and, while we are indebted to Mr. Jaquet for his contribution to the subject, there is still much to be answered in addition to the questions suggested by his own able pen.

CHARLES S. PALMER.

New York, April 3, 1905.

ORE-DRESSING DATA.

The Editor:

Sir—On behalf of engineers and technical workers in various isolated parts of the world, I wish to enter a plea for the publication of data in regard to the working, etc., of different kinds of reduction machinery.

For years we have had contributions in regard to stamp mills (your own work standing as a classic on the subject); we all know what the comparative life of the different wearing parts is, according to the nature of the ore treated, etc., and we constantly see articles on stamp-mill practice in various parts of the world. This is always of interest, especially to anyone who is working a stamp mill; but when one has in mind the erection of a less expensive plant there comes the wish that people would branch out in other directions and give their experience in running, say, Huntington, Kinkead, Chilean and other kinds of modern mills.

The man of small means is always interested in trying to find some plant which does not require as big an outlay as a stamp mill, and yet which is effective in its work; the choice, however, is so bewildering, as the number of these modern mills is legion, that he turns in desperation to a machinery firm, and is generally landed with something that doesn't suit his purpose at all. A friend of mine who has been anxiously casting about to find the best re-grinder, and has been obliged to work round in a circle because reliable data in regard to capacity, wear and tear, etc., have been most difficult to obtain, suggested, in his despair, that an international committee of qualified engineers should be appointed for the purpose of testing various kinds of reduction machinery, and these should select some central place where every mill manufacturer should send his machine to be tested on different kinds of ore. After the tests were finished, each manufacturer would receive a certificate of efficiency (or otherwise) which would serve as a guarantee to the rest of the world, and the would-be purchaser would know that "the truth and nothing but the truth" was being given to him. The idea, which is most decidedly on the Utopian order, has certainly a great deal to recommend it, for, at present, what credence can we place in catalogue testimonials which may be spurious or manufactured to order?

Considering how many people there are in the world who are working, and will continue to work, with mills other than stamp mills, what an advantage it would be if they could be induced occasionally to give a few figures in regard to the working of their plants! Doubtless, if appealed to, they would willingly do it, although they might think that, inasmuch as they were perfectly familiar with their own type of mill, and had everything at their finger tips, the rest of the world must have equal knowledge, and that the publication of any data would be superfluous. What a boon it would be to the profession generally if the people referred to would give data in regard to: 1. Kind of mill. 2. Kind of ore treated. 3. Hardness of same. 4. Whether mill is used as a primary crusher or for re-grinding. 5. Size of ore entering mill. 6. Kind of screen used and size of mesh. 7. Number of tons crushed per 24 hours. 8. Nature of wearing parts, whether iron or steel. 9. Wear of crushing parts in lb. per ton of ore crushed. 10. Cost of renewals. 11. Amount of horsepower required. 12. Amount of fuel—either coal, wood or oil—per 24 hours. 13. Amount of water required daily for mill and boilers. 14. Attendance necessary on the mill. 15. Average cost per ton treated. 16. Length of time mill has been in operation. 17. Practical suggestions. Given data of this sort, which would combine various experiences with different kinds of mills from all over the world, we would have something the value of which would be inestimable. Where can data of this sort be obtained? Take Richards' 'Ore Dressing' (admirable work that it is), with all its mass of detail, and even it does not supply sufficient data. Under the heading of 'Pulverizers Other Than Gravity Stamps' most of the data is taken from catalogues; this is not the evidence wanted, for it is obviously the object of catalogues to make as good a showing as possible, whereas the testimony required is from those who are operating in the field and can generally be relied upon as being unbiased. I have had occasion recently to look up the subject of re-grinding, and, outside of the valuable paper by M. Schwerin, I could find nothing in your issues of last year, leaving aside the discussions on tube-mills, bearing on the subject.

I hope, sir, that you may see fit to second this plea, for I am certain that a few lines from your versatile pen would be productive of much good and induce many of your readers in all quarters of the globe to spare a few minutes and give some of their information to the profession.

E. H. GARTHWAITE.

Bulawayo, Rhodesia, Feb. 20, 1905.

PYRITE SMELTING.

The Editor:

Sir—Pyrite smelting has been the subject of much discussion in THE ENGINEERING AND MINING JOURNAL, and under certain peculiar conditions, which are purely local, it is entitled to be called a process, as distinguished from ordinary blast-furnace smelting.

All blast-furnace smelting, even lead smelting with the use of 14% of coke, will eliminate some sulphur from the charge, which passes off with the flue gases, and some iron must be liberated and go into the slag as a result. Not more than 70% of the sulphur on a lead charge can be accounted for by the matte produced under conditions when a heavy reducing action is indicated by the production of a small amount of speiss along with the lead-copper matte. This indicates that, even in the presence of so much as 14% of coke, sulphides do burn, and, once combined with oxygen, they are separated by the reducing action of the fuel, or the gases of partial combustion.

The proper conditions for the greatest amount of *reduction*, or the reverse, the greatest amount of *oxidation*, in a blast-furnace are so much affected by the method of feeding and the arrangement of the particles in the furnace that, without taking these conditions into consideration along with the volume of blast per minute, there is no certainty what kind of a slag will result. For example, suppose a furnace is running on a charge producing 30% copper matte, and making a slag containing 30% SiO_2 and 0.3% Cu. The percentage of fuel may be anything from, say, 5 to 12, depending upon the amount of pyrite on the charge, and also the amount of copper and the degree of roast, if any. Now, suppose we speed up the blowers or put on more blast in any suitable way; we would notice the following results: (1) The tonnage smelted will be increased, (2) the matte will contain a higher percentage of copper, and (3) the slag will contain more iron, less silica and more copper, not in exact proportion as the blast is increased, but governed by it. All of these conditions are changed by simply increasing the blast volume per minute.

Pressure does not mean anything except resistance, and it may be caused by charge burden or slag in the tuyeres, or it may mean that the tuyeres are too large or too small. After these conditions are adjusted to an equilibrium, suppose we change the method of feeding from an even distribution of fine and coarse particles to placing the coarse pieces near the wall and the fine in the center of the shaft.

The result will be a further oxidation of sulphides, resulting in a further increase of iron in the slag and a corresponding decrease of silica. The percentage of copper will increase in both the slag and matte, and the amount of matte produced will decrease. All of these changes of composition of the furnace products will be affected, *not* by any change of charge or fuel, but by increasing the volume of blast and altering the arrangement of the particles composing the charge. The furnace will not continue to run for long without crusts forming on the walls, and this may increase at one end or on one side and diminish or entirely disappear on the other, for the passage of the furnace gases is so restricted that it results in blow-holes; and these affect the oxidation to such an extent that it frequently happens that two furnaces running on the same charge will produce slags varying 3 or 4% SiO_2 or Fe, and mattes varying as much as 10% in copper content.

In this manner we may vary the action of the furnace, and if we continue to increase the blast we finally arrive at a point where the copper losses in the slag, together with the precious metals or others if there be any, would be too great to allow a further concentration on a commercial basis. The slag losses increase much faster than the grade of the matte, and while we may have increased the copper in the matte from 30 to 40% the slag will have increased from 0.3 to 0.6% or more. All this goes to show that the pyrite is not the only thing that is oxidized; copper and nickel and all the associated metals in the charge get their share of oxidation, and that is opposed to the collecting action of the matte. Slags formed under such conditions resemble slags made in the copper converter; they are foul and contain a considerable percentage of peroxidized iron, which renders them magnetic. They will not decompose with acids without fusion with an alkali carbonate.

The remarkable effect of reversing the distribution of the pieces composing the charge is shown in lead smelting, where it has been demonstrated that it is absolutely necessary to feed the fine to the walls and the coarse to the center in order to get the reduction necessary to prevent excessive oxidation and loss. About the year 1883 the flat-top lead furnace was introduced in nearly all the Colorado smelters, and at first they were fed through a narrow thimble; but in every case this had to be abandoned because it had the effect of placing the entire charge in the center until it sank below the end of the thimble, releasing the coarse pieces, which rolled to the sides and ends of the shaft, while the fine all settled down in the center. The blast naturally passed up through the coarse pieces and caused over-fire behind the thimble, the reduction stopped, and almost immediately the bullion production decreased to an alarming extent. These were 'pyrite smelting' conditions applied to lead smelting, and the reverse of what should have been.

The feeding was then done by shoveling the coarse to the center and the fine to the walls, forcing the carbon monoxide formed at the tuyeres to penetrate the charge to the center and act as a reducing agent all the way up through the charge. Later, when automatic feeding from a car was introduced, it was found that the charge had to be dumped so that it would be highest against the walls, and the large pieces could roll to the center, preserving the conditions as described. If at any time a number of charges were dumped in the center the conditions would become reversed, over-fire would start, and bullion production would stop or decrease.

The bell-and-hopper feed of the iron blast-furnace is admirably suited for a round furnace, as it forces the stock to the outside and leaves the center lower, so that the pieces arrange themselves in the order required for reduction; but this method of feed is not suited for rectangular furnaces for lead smelting, and is not required for copper smelting, as was demonstrated at Aguas Calientes, Mexico, in 1896.

In pyrite smelting, dumping the charge-cars from the side results in the coarse pieces going to the opposite side and the fine landing in the center, especially if the surface of the charge is 5 or 6 ft. below the level of the feed-door. The result is that there is a ring of fire and escaping gases around the edges of the charge, and the center is perfectly dead. I saw this strikingly illustrated about two years ago at the works of the Tennessee Copper Company, where a man fell into a furnace smelting 600 tons per day. He picked himself up and walked around on the dead center and tried to climb out, until the blast was shut off and a ladder lowered to him, when he climbed out within reach of men at the feed-door. The only injuries he sustained were to his hands and face and parts of his body where his clothing had burned. It was thought that his lungs would be injured, but this was not the case. Afterward it was found, by putting in pieces of paper, that there was a down draft of air in the center induced by the blast around the sides. As the carbon monoxide did not penetrate to the center of the charge it could not exert any reducing action, and therefore the conditions for oxidation and concentration of matte were present and active, resulting in making a 40% matte out of the 3% ore.

Under all such conditions of high concentration by oxidation, the resulting slags are much higher than they would be if the conditions of blast, fuel and feeding were reversed to produce the conditions necessary for reduction. The commercial aspect of the case is, however, governed by local conditions, and depends entirely upon which method gives the greatest net return from the ore. Some men argue that it pays better to waste metals and save coke than the reverse. However this may be, I note where one company turned a surplus into a deficit by following the plan. It would appear that a dollar's worth of coke saved is not worth as much as two dollars' worth of metals wasted.

The two-stage operation of first making a low-grade matte 12 to 20%, re-smelting and concentrating this to 35 or 40%, and re-smelting the slag from the matte concentration when it is high enough to justify it, seems to be the best plan devised. Trying to make a converting grade in one operation results in too high slag losses and short furnace compaigns. At La Aurora, Mexico, a middle course was taken. A 6% ore containing 11% Zn was part roasted in stalls and piles and smelted with equal part of green 'fine' and 6.5% coke. The resulting matte, about 35%, was converted and the converter-slag added to the charge. The blast-slag contained 10% Zn and 0.6% Cu. The high copper content of slag was due to high blast and zinc, otherwise the zinc gave no trouble. An ore containing zinc will make a higher concentration than if the zinc were replaced by iron.

The degree of concentration is all dependent on the blast, the fuel, feeding, and the amount of iron in the ore. An ore containing a small percentage of iron will make a higher concentration—that is, more tons of ore into one ton of matte—than an ore containing a higher percentage of iron. Hot blast may be a benefit, but it is a luxury that at many plants they have found they can get along without.

It is a difficult point to define, but I should say that pyritic smelting does not begin until the slags show the characteristic peroxidation of the iron as evidenced by chilled samples refusing to decompose without fusion. If a chilled sample will not give white silica without fusion, you may be quite sure that it has been produced under conditions of oxidation characteristic of 'pyrite smelting.'

HIRAM W. HIXON.

Victoria Mines, Ont., April 4, 1905.

In a recent issue of *Stahl und Eisen*, a neat method is suggested for the determination of silicon in ferro-silicon. The 0.5-g. sample is finely powdered in an agate mortar and fused in a covered nickel crucible with pure potassium hydroxide (in small lumps), which surrounds and covers the sample under treatment. The crucible is supported by a wire gauze, with a small flame below the latter, for half an hour; the flame is then turned up so that it touches the gauze, and the crucible is exposed to this for 20 minutes. After cooling, the melt is dissolved in hot water, then acidified with hydrochloric acid and evaporated as in the usual silica determination. Samples ranging from 45 to 55% silicon gave good results.

Mining Stocks.

(Full quotations on pages 727 and 728.)

New York. April 12.

The stock market is impulsive, each new high record in the quotations of certain specialties being followed by a reaction to 'feel' the public opinion, as it were. A day's sales showed over 237,000 shares of Amalgamated Copper at as high as $87.75, an advance of nearly 18 points since January, a record in two years. Anaconda's rise to $31.25—a gain of over $3 per share in four months—interests few outsiders. Greene Consolidated Copper's bi-monthly dividend of 40c. per share has helped to elevate the stock to $30.375, but trading in it is limited. Heinze's United moved up to $14.25 for the common shares. British Columbia Copper hovers around $7.50.

A sale of 250 shares of Homestake Gold, of South Dakota, is noted at $79, a price that will yield nearly 8% in dividends annually. Horn Silver, of Utah, is well supported, because with the March dividend of $20,000 there has been distributed a total of $5,442,000; the stock sold recently at $1.75. Alice, of Montana, is weaker, selling down to 45c. Ophir, of Nevada, shows marked strength, advancing to $11.50 by reason of the improvement in the financial position of the company. Elkton Consolidated, of Cripple Creek, softened from 60c. to 54c., notwithstanding its payment of 0.5c. monthly dividends. Iron Silver, of Leadville, as a result of a third 10c. dividend this year, is firm, selling at $3.50.

The industrial shares have attracted more attention. American Smelting & Refining occupies the center of the speculative arena, partly because people believe the company will derive certain benefits from the pending consolidation of the Pacific Coast smelters, and also that the formation of the American Smelters' Exploration Co. means a better concentration of the smelting trust's business. Tact is also shown by the smelting company's officials in handling the plan for amalgamating the National and United Lead companies. This secrecy has had the effect of stimulating speculation in the shares of the American Smelting & Refining Co. The common stock made the high record at $119, and the preferred at $127 recently. Thus the market value of the company's property has appreciated $4,000,000 above its capitalization, while in the past four months the 5% common stock advanced $39.25, and the 7% preferred, $15.75. Simultaneously there has been increased activity in Federal Mining & Smelting, the 10% common stock (par $100), touching $128, and the 7% preferred, $107.50. The increase of the market value over the capitalization of the company's property is nearly double what has already been paid in dividends.

United States Steel shares are particularly interesting because the preferred has jumped, on April 7, to $103, and the common to $38.25, record high prices.

Boston. April 11.

Outside of Amalgamated Copper, which has risen over $6, to $87.50, during the week; the only activity has been in the Utah stocks, and particularly in United States Mining. This stock has been persistently bought by New York interests, and the price has advanced $3.25, to $30.50. The talk of a deal is put forth, but nothing definite can be gleaned. It has been reported that the American Smelting & Refining people were after control of this property; in fact, it is reported that $35 per share has been offered for a controlling interest, but without avail. Bingham took a start a day or two ago and has advanced $2.75, to $33.75. There has been a steady purchaser for all the Utah Consolidated stock offered, and as a result the price is up almost $1, to $43.25. Boston Consolidated is also in better request, responding with an advance of almost $1, to $7.62½.

The strikes at the Lake Superior mines have hampered market operations in these stocks, although prices show little variation from a week back. It can well be said that the local copper share market has its headquarters in New York, and it would not be surprising if Boston were to lose control of a few of these properties in time. Greene Consolidated has been well handled, and since the dividend announcement has advanced $2, to $30.25. Centennial is selling plus $2 of the assessment paid. It touched $20 on this basis, but subsequently lost $1. Allouez is off $1.25, to $21, and Adventure $1, to $5. Good buying of Parrot caused the price to advance $3, to $30.50, on increased dividend talk. The action of Trinity is still mystifying. It seems to be pegged at $10, although it touched $9.75 during the week. Copper Range has been fairly active, although there is no character to the trading. It is up one day and down the next. Its variation this week has been from $75.50 to $78, closing at $77.25 to-night. The talk that there was little likelihood of a Mohawk Mining dividend this year caused the stock to be heavy around $53.

Dominion Iron is off $1.62½ for the week, to $22. Advices from Montreal state that an issue of $1,000,000 second mortgage 6% bonds has been decided upon.

Old Dominion is heavy around $26.50, with little demand. The copper production last year was 15,368,147 lb., or double that of 1903. A total of 111,345 tons of ore was treated, against 57,210 tons. Of this, 35,000 tons was custom ore, against 1,444 tons in 1903. The cost of handling and treating the ore was materially reduced from the preceding year.

Colorado Springs. April 7.

The local stock market has been rather active during the week, and there have been declines in a number of stocks. At the close, however, there was more activity. El Paso sold as high as $2.35, closing at $2.15@$2.25. This stock has more than doubled in selling price since January. Portland sold up to $2.53, closing at $2.40@$2.45. Portland has gained 63c. since the first of the year. Findley advanced during the week from 62c. to 75¼c., the closing price. Isabella sold at 31c., closing at 29¼c. Gold Sovereign was quite active, selling up to 15⅞c. Work was quiet around 14c., and United Gold Mines sold at 23½c.; while Independence closed at 25c. per share.

Salt Lake City. April 7.

The mining stock market has been in fairly good shape this week, and the trading was mostly in stocks belonging to the Tintic district. May Day again took the lead, but the stock came down to a low level, recovering again, however, towards the close. A good many brokers took a "flyer" at Little Chief, on the strength of a marked improvement in conditions at the mine. Uncle Sam Consolidated, Yankee Consolidated, Star Consolidated, Mammoth and Tetro were among the other active Tintic stocks, but these show a slight softening. Little was done in Park City stocks, the market for them being affected by the cave in the Ontario drain tunnel. The work of tunneling around the caved section is progressing, but no change in the present situation is anticipated for a week or ten days.

San Fran ‹. April 6.

The feature of the week on the old exchange has been another jump in Ophir, which went up until it reached $8.75 per share. Usually such a rise would have carried up the other stocks with it to some extent, but this has not been the case now, and there was very little change in the other Comstocks. Probably one reason for this is that so much of the trading has gone to the Tonopah and Goldfield stocks that the old shares are probably neglected, with the exception of one or two specials.

Around the close Ophir sold at $8.50; Consolidated California & Virginia, $1.65; Mexican, $1.65; Hale & Norcross, 80c.; Sierra Nevada, 41c.; Gould & Curry, 20c. per share.

On the San Francisco & Tonopah exchange business was comparatively quiet, but there was a fair amount of trading done. Some quotations noted are: Montana Tonopah, $3.50; Tonopah Midway, $1.75; Tonopah Belmont, $1.55; McNamara, 54c.; Original Bullfrog, 35@40c.; Tonopah Home, 29c. per share.

On the California exchange trading in oil stocks continues rather quiet. Sterling sold for $1.90; Home, 47@49c.; Wolverine, 41c.; Superior, 5c. per share. Trading was heaviest in the low-priced stocks.

Monterey. April 4.

Heavy purchases on New York had the effect of pushing exchange up to 202.375 toward the end of the week.

In mining stocks Dos Estrellas continues to climb, reaching last week $3.725; Victoria (El Oro) brought $42; Borda Antigua, $30; Oro Nolan, $60; La Union, $130; Santa Maria de Guadalupe, Zacatecas, $82; Barreno, San Luis Potosi, $105; La Paz, Matehuala, San Luis Potosi, $302; San Felipe de Jesus, Pachuca, $15; San Francisco, $85, and Sorpresa, $305.

Coal Trade Review.

NEW YORK, April 12.

ANTHRACITE.

The hard-coal market shows no excitement over the prospect of an unusually heavy demand at bottom prices. It is a foregone conclusion that producers can always, at this season, dispose, without special effort, of all the coal that they can mine, so that the only question is as to the possibility of enlarging output. All mines are working full time, and shipments to New York harbor are arriving promptly and regularly.

The steam sizes remain at their old prices, and domestic sizes will remain for this month at 50c. below the circular price, being quoted, f. o. b. harbor shipping points, as follows: Broken, $4.25; egg, stove and chestnut, $4.50. Steam sizes: $3 for pea, $2.25@$2.50 for buckwheat; $1.45 @$1.50 for rice, and $1.30@$1.35 for barley.

Not much importance is placed upon the rumored determination of the New York Central to parallel the New Haven road between New York and Springfield, thus obtaining an entrance to Boston. This has been suggested as a move in retaliation to the acquisition of the New York, Ontario & Western by the New Haven company.

BITUMINOUS.

The Atlantic seaboard soft coal trade has a considerable amount of coal moving, but prices are weak on current busi-

ness. A great tonnage of coal ordered to New York last week, for speculative purposes, has an oppressive influence on the market. Car supply also has been very good, and, with the excellent prevailing transportation facilities, has had a tendency to over-supply the market. The taking of contracts seems to be moving smoothly, although the weakening of the current prices has had a slight tendency to delay some of the contractors, in the hope of getting 5 or 10c. off. The better grades are sustaining contract prices satisfactorily, but the lower grades, in some instances, are sold at 5 or 10c. less, in order to take business. The bituminous trade is affected by the lower schedule prices on anthracite, through the fact that all yards and the consumers of both kinds of coal are giving their whole attention to the handling of hard coal, in order to take advantage of the April discount. The result also of the sudden improvement in car supply, by which the winter figure was multiplied by two or three, has led to inequalities, to which the producers have not been able to accustom themselves at once.

Trade in the far East shows a cleaning up of a good many orders in the hands of shippers, including a proportion of the new contract season's business, although sufficient orders are now coming in to keep the trade moving quietly. Trade along the Sound is quiet, this territory seeming to be affected more than any other by the hard coal discount. New York harbor trade is quiet, with a considerable surplus remaining unplaced at tide. Prices are weak, at about $2.35, f. o. b. New York harbor shipping points.

All-rail trade appears to be moving less tonnage of bituminous than heretofore, the idea prevailing that undivided attention should be given to anthracite. Transportation from mines to tide is excellent and car supply is equal to all demands.

Coastwise vessel market shows a good available supply all around. Delays in loading hard coal have driven some vessels to load with bituminous, which would not otherwise have been available. Philadelphia quotes on large vessels as follows: To Boston, Salem and Portland, 75c.; to the Sound, 65c.; to Lynn, Newburyport, Gardner and Bangor, 90c.; to Portsmouth, 80c.; to Saco, $1 and towages; to Bath, 75@80c. Rates from Norfolk and Newport News are about the same as from Philadelphia. New York harbor quotes 65c.@75c. to around the Cape, and 80c. to ports farther east.

Birmingham. April 10.

The coal situation in Alabama shows slight improvement over last week. The output is quite steady, despite the strike at the furnace companies' mines. The State mine inspector and his assistants are busy watching operations, accidents happening constantly. Two white men and one negro were killed the past week, with two or three injured.

There is nothing going on in this State at present to indicate that either the union miners or the furnace companies have any intentions of coming to an agreement in the near future. The union miners will hold their annual meeeting on June 12 and will elect their officers for the ensuing term.

The union men have been furnishing transportation back to their respective homes to non-union men brought to this district to take the places of the strikers, this plan being quite expensive.

The Galloway Coal Co., owner and operator of four mines in Walker county and one in Winston county, producing at those places more than 350,000 tons of coal, during the past week signed a year's contract with the Knights of Labor, the same wage scale as has been in effect being signed again. The contract extends from April 1, 1905, to April 1, 1906. J. R. Pill is the general superintendent for the Galloway Co. and is very popular with the employees. The same company also owns and operates mines in Bibb county, employing United Mine Workers.

Chicago. April 10.

There has been much bituminous coal on track in the last week, and sales have been forced in many cases to save demurrage. Western coal brings very low prices in such emergencies, which, unfortunately for the trade, have become frequent in the last two years. The only really significant feature of the present situation, as distinguished from previous overloading of the market, is that fine coals are not so low as formerly. This is due chiefly to the fact that operators have ceased to produce domestic sizes, for which the demand is over, and are shipping run-of-mine. Screenings now bring $1.30@$1.50, the normal market price for a year past, which have been frequently cut to as low as $1. Run-of-mine from Illinois and Indiana mines is quoted at $1.30@$1.60, and lump brings, when it can be sold, $1.60@$2.25.

Eastern coals share with western the overplus of production. Smokeless has sold as low as $2.60 for run-of-mine, against $3.15 circular price. Much smokeless has been disposed of to save demurrage at 25@40c. below standard quotations. Hocking brings about $2.90 and is not in large demand, but shipments are not crowding forward, as in the case of some other coals. Youghiogheny, as the leading gas coal, is in somewhat light demand, but without notable over-supply; it sells for about $3.

Cleveland. April 11.

The movement of coal up the lakes is beginning to absorb the attention of the shippers. The first boats have started for the head of the lakes. At present they can run to Milwaukee, but it is a question whether they will be able to get through to the head of the lakes before the last of this week. The movement started out rather heavy, and boats are in good demand at the rates established earlier in the season—45c. to Milwaukee and 35c. to the head of the lakes.

The demand for steam coal in this territory is a little stronger, with the market somewhat stronger in consequence. Prices hold about as they have been, with Ohio and Pennsylvania coal bringing $1.05 @$1.10 at mines. Prices for slack are beginning to ease off a little, as usual, when the season of navigation opens. Both Ohio and Pennsylvania slack is now selling at 60@65c. at mines.

The coke situation is strong, with a division of sentiment. Some of the ovens expect higher prices and are offering to sell for $3.15@$3.25 at the oven for the best grades of 72-hour furnace coke, while the larger concerns are still quoting $3 at the oven for the same material. About all of the ovens are united on their quotation of $2.65@$2.75 for furnace coke at the oven.

Pittsburg. April 11.

Coal.—An important and unprecedented coal deal has just been concluded. The Pittsburg Coal Co. has entered into a contract with the United States Steel Corporation to furnish its plants in the Pittsburg district with coal for a period of 25 years. It is estimated that from 6,000,000 to 10,000,000 tons will be required annually. The terms are not made public, but it is understood the price is a profitable one, and is based on the cost of mining. President Francis L. Robbins, of the Pittsburg Coal Co., is in New York completing the details of the contract. Most of the coal will be supplied by the Monongahela River Consolidated Coal & Coke Co. This effectually refutes the rumor circulated during the past few days that the Pittsburg Coal Co. is about to dispose of its control in the river company to an eastern syndicate. It is reported that the Steel Corporation has closed a long-term contract with Illinois coal operators for coal for its plants in Chicago and vicinity. Shipments to lake ports have begun, but the lake season will not open before April 15. The competition for the lake coal trade will be unusually sharp this season, and there is likely to be some cutting in prices. No announcement has yet been made of prices by the Pittsburg Coal Co., which is the largest shipper, and it is reported that the Hanna interests of Cleveland have cut the former price of $2.60 a ton for fuel coal to $2.10 a ton, which is the rate for cargo coal. There is no change in prices here, coal being quoted on a basis of $1@$1.10 for run-of-mine.

Connellsville Coke.—Production and shipment remain about the same as last week, and prices are firm, at $2.25@$2.50 for furnace, and $2.75@$3.25 for foundry. The production was 263,029 tons and the shipments 11,925 cars, distributed as follows: To Pittsburg and river points, 4,611 cars; to points west of Pittsburg, 6,108 cars; to points east of Everson, 1,206 cars.

Foreign Coal Trade. April 12.

Imports of fuel into France for the two months ending Feb. 28, were as follows, in metric tons:

	1904.	1905.	Changes.
Coal	1,711,330	1,630,120	D. 81,210
Coke	186,260	218,150	I. 31,890
Briquettes	82,880	79,190	D. 3,690
Totals	1,980,470	1,927,460	D. 53,010

The principal imports were from Great Britain and Belgium. While the complete figures for exports are not yet published, they were very large in February. Thus, shipments from the Nord and the Pas-de-Calais to Germany in that month were 206,790 tons, an increase of 130,000 tons over last year.

The total production of coal in France for the full year is reported as follows, in metric tons:

	1903.	1904.	Changes.
Coal	34,217,661	33,838,130	D. 379,531
Lignite	688,757	664,159	D. 24,598
Totals	34,906,418	34,502,289	D. 404,129

There was a decrease of 1.2% in the total production last year.

Iron Trade Review.

NEW YORK, April 12.

There has been something of a lull in new orders, but this was to be expected, as almost all consumers are fully covered for the first half of the year. Buying for third quarter is always well in hand, and most of the new orders now coming in are for delivery in the fourth quarter of the year.

In pig iron there has been nothing specially new. The United States Steel Corporation has made no further outside pur-

chases, but has very nearly all of its furnace capacity busy. About the only active transactions during the week have come from foundries which need moderate quantities to keep up their stocks, and in many cases they have been forced to go to jobbers to get the deliveries they want.

In finished material the situation is very much the same. Contracts covered would be well taken for the current quarter. New business is mainly for lake deliveries. The prospects for structural material are much better than they were. The only new demand noted is for rails for electric companies, and a number of contracts of this class are under negotiation.

The business already in sight makes it sure that mills and furnaces will be fully occupied during the balance of the year.

Birmingham. April 10.

Alabama furnacemen are still enjoying a strong demand for iron, and some sales have been made recently in large lots. It is estimated that during the first week in this month not less than 100,000 tons of iron were sold by the makers, deliveries for the third and fourth quarters of the year. The Sloss-Sheffield Steel & Iron Co. alone on Thursday of the past week sold 10,000 tons of iron. It was announced that two interests during the past week sold nearly 50,000 tons of iron alone, delivery to extend to the last of the year.

The furnace companies are not anxious to give out much information concerning the market just now, as the railroads threaten to restore the rates on coke brought to this district from West Virginia. There were two extensions of the special low rate and the time is out again April 15. It is claimed that the special rate given did much towards holding down iron-making cost in the face of the strike of the coal miners.

The following quotations are given: No. 1 foundry, $14@$14.50; No. 2 foundry, $13.50@$14; No. 3 foundry, $13@$13.50; No. 4 foundry, $12.50@$13; gray forge, $12@$12.50; No. 1 soft, $14@$14.50; No. 2 soft, $13.50@$14.

There is no denial of sales of No. 2 foundry at $13.50 per ton, but that price is positively given as the minimum. One of the smaller iron companies in this district is said to have established that price as a maximum for a certain period, but the indications are that the firm will shortly be sold far ahead and will be unable to handle the business on anything like reasonable time delivery.

A shortage of hands is reported at the steel plants at Ensley, and common labor in particular is wanted there.

Chicago. April 10.

The iron trade has shown little change in the last week. Sales of pig iron, according to agents, continue to be good, but there is apparent a feeling of less confidence in the strength of the market. Prices continue unchanged—$13.50@$13.75 for Southern, Birmingham, or $17.15@$17.40, Chicago, and $17.50 for Northern. The Southern furnaces would seem to be retreating somewhat from their firm stand of a week or two ago, for they are now selling freely where they can find buyers at $13.50, Birmingham, for deliveries in the last quarter of the year. They have hitherto asked a slight premium on the smaller lots for late delivery. Northern is more even as regards sales than Southern, and selling agents profess to believe that the outlook for Northern is as firm as ever.

Buying is still in small lots, but inquiries are occasional for large quantities, and it is probable that as many of these orders are being placed as usual at this season of the year—certainly more than were placed a year ago. In finished material the trade has seen a busy week; this indicates a probable upholding, if not strengthening of the market. There do not seem to be any signs indicating a falling market, and there are many slight indications which, taken together, seem to support the claim of the furnace agents that there will be no serious check soon upon the iron industry.

Coke is still in rather light demand, but with no general overplus of shipments, the supply being fairly well regulated to the demand. Connellsville 72-hour brings $5.65, and standard cokes 25c.@50c. less.

Cleveland. April 11.

Iron Ore.—By an agreement between the longshoremen and the dock managers, and between the officers of the Great Lakes Towing Co. and the licensed tugmen, the labor situation on the lakes has been completely cleared up, and there is now no danger of any strikes to prevent the early opening of the season of navigation. A number of boats are bound in each direction now, and the only thing that will hinder lake navigation will be the condition of the ice in the channels between the lakes. The latest reports are that Escanaba will be opened for navigation by Saturday of this week, while the same date is set for the passage of the first boat through the Soo. The wild rates have been the same as the contract rates, being, for the first cargoes, 75c. from the head of the lakes; 70c. from Marquette, and 60c. from Escanaba, to Ohio ports. There have been a few small sales of ore, but later on it is expected there will be some good selling. The market holds firm, at $3.75 for bessemer old range; $3.50 for bessemer Mesabi; $3.25 for non-bessemer old range, and $3 for non-bessemer Mesabi.

Pig Iron.—The buying for immediate shipment of foundry iron is light. Prices are holding at $16 in the Valley for No. 2. The principal strength in that market is the buying for future delivery, most consumers being willing to cover the major portion of their needs for the last half of the year. Prices are holding even at $16 for No. 2 on that delivery also. The Bessemer Association has made no new sales of late, but a few of the smaller buyers are taking a good deal of material in small lots, the price holding firm at $15.50 in the Valley. The basic trade is also strong, with the price holding at $15.50 in the Valley, and with a shortage of material being imminent a little later.

Finished Material. — The principal strength of the market, in a way differing from the strength shown a short time ago, has been the buying of steel rails for traction lines. These properties have been awaiting an easier money market to put out new issues of stock and bonds to aid them in the extension of their properties. The time being favorable for such ventures, the extensions are being made. The buying of steel rails is consequently heavier. Eastern mills are well filled with orders, whereas they were easy a short time ago, and are not able to take the overflow business from this section. In consequence a still further congestion of the market is expected. Buyers are not in many cases forced to go to the jobbers to get what they need.

New York. April 12.

Business in the local market is quieter, and there is a lull in orders for new work.

Pig Iron.—Sales have been mainly in small lots. A reduction of 25c. has been made in Northern iron, for later deliveries, but has had little effect. We quote for Northern brands, in large lots: No. 1X foundry, $17.50@$17.75; No. 2X, $17.25@$17.50; No. 2 plain, $16.50@$16.75; gray forge, $15.75@$16. Virginia foundry is firm, at $17.65@$17.90 for No. 2. Virginia basic is strong, around $17.75. On Southern iron there have been no concessions, and holders are firm. We quote for large lots on dock as follows: No. 1 foundry, $17.75@$18; No. 2, $17.25@$17.50; No. 3, $16.75@$17; No. 4, $16.25@$16.50; No. 1 soft, $17.75@$18; No. 2 soft, $17.25@$17.50; gray forge, $16.25@$16.50.

Business in warrants on the Produce Exchange is slow. For May and June, late quotations are $16.65 bid, $16.75 asked for regular warrants; $16.70 bid, $17 asked, for foundry warrants.

Bars.—Bar iron continues steady and in good demand, quotations for large lots being 1.745@1.845c. Steel bars are quoted at 1.645c. Store trade is good, and prices are 2@2.25c. delivered.

Plates.—The demand for plate has eased off a little. Tank plates are 1.745@1.845c.; flange and boiler, 1.845@1.945c.; universal and sheared plates are 1.645c. up, according to size.

Structural Material. — Structural material is selling in lots of moderate size. Beams under 15 in. are 1.745c. in large lots; over 15 in., 1.845c.; angles are 1.745c. Extra prices are charged for small lots.

Steel Rails.—The regular quotation continues $28 per ton at mill for standard sections. Very little business is done in this market. Light rails are in less demand, and prices are lower. Sales have been made as low as $24 for 12-lb. rails, while 25-lb. to 35-lb. can be had at $21, for large orders.

Old Material.—Scrap of all kinds is in good demand, and prices are firm. Railroad wrought is quoted $20@$21; best yard wrought, $17@$18; heavy steel melting scrap, $16@$17; machinery cast, $14@$15. These prices are on cars, Jersey City, or other terminal delivery.

Philadelphia. April 12.

Pig Iron.—Millmen, founders and others continue to provide for future requirements. The greatest activity is in basic iron, and nearly every consumer has either made purchases within a short time or has entered into some sort of an arrangement which guarantees provision for the future. The plan now is to secure basic pig for consumption during the third and fourth quarters of the year, and along these lines some large contracts will be placed this week. The mill people are still picking up forge iron in a conservative way. Foreign irons are also being looked up, and the present negotiations may, and probably will, result in some large transactions in English and Scotch. The general trend now is to make sure of iron for the last half of the year. Prices are very firm, and quotations may be approximately given at $18.50 for No. 1 foundry; $18 for No. 2; $17.50 for No. 2 plain; $16.50 for gray forge; $17 for basic; $20.50 for low phosphorus.

Muck Bars.—The average selling price for muck bars this week is $29.50, and there is a good demand.

Billets.—Billets rule high, and are hard to get for early delivery. The manufac-

turers have been unable recently to make satisfactory terms for delivery of material. There is a rumor that for special accommodation premium prices have been offered. Buyers are trying to secure supplies at $28@$28.50, but they will be obliged to pay more or go without.

Merchant Bar.—Prices are well maintained; best refined is quoted at 1.80 delivered; steel bars, 1.70, which is readily paid by all who must have early deliveries. Slight concessions from these figures are allowed on later deliveries.

Sheets.—Notwithstanding the enormous production, some buyers who thought they were sufficiently early in the market are complaining that deliveries are not being promptly made. The oversold condition of the mills in this territory has been noted by large consumers, and some of them have recently opened negotiations looking to the summer deliveries and later. Quotations are very strong and range from 2.40 to 2.80, with two-tenths higher for the better grades.

Pipes and Tubes.—This branch of the industry is in a satisfactory condition. There is an increasing consumption of both pipes and tubes.

Merchant Steel.—Merchant steel, at its slight advance, is in very active demand, and all kinds used in this territory are being ordered in advance of actual need.

Plates.—Steel plate is in very active demand, and there are rumors that some large consumers will be obliged to look to foreign sources for supply. Our plate making capacity is well sold up. Quotations are strong, and for early delivery an advance was made within a few days. Tank is quoted at 1.73½; flange and boiler steel, 1.83½; locomotive firebox, 2.23½ cents.

Structural Material.—There is quite a rush of business for structural steel, for bridge purposes mainly.

Steel Rails.—Contracts for steel rails booked within the past few days foot up about 28,000 tons, including two orders for light rails; inquiries are in the market for about 50,000 tons, which may be placed any hour.

Scrap.—Scrap continues high, and the better grades are scarce. Old steel rails are $18.50; old iron rails, $26; wrought railroad scrap, $23.50; best yard scrap, $21; No. 1 steel scrap, $18; machinery scrap, $16.50 per ton.

Pittsburg. April 11.

The pig iron market is quiet this week as to actual sales, but there are a number of inquiries. Among them is one for a large tonnage from a leading independent steel interest. There may be some difficulty in getting the iron, as a number of the furnaces are entirely sold up for the second quarter. Sales of all grades of pig iron for the week in this market do not exceed 6,000 tons. The Maryland Steel Co. has placed a contract for 30,000 tons of foreign bessemer pig iron, and deliveries will begin before the end of the month. This iron is intended for steel rails on a South American contract, and the company will receive a rebate of 99% of the duty on the iron. Present prices of pig iron do not warrant importation for domestic consumption, but if the demand continues it may be necessary to bring iron in from abroad. The Carnegie Steel Co. has just awarded a contract to the Riter-Conley Manufacturing Co. for the erection of a blast furnace at Mingo Junction. Official announcement was made to-day of the contract, and denial given to the reports that two furnaces are to be built at Duquesne and two at Donora. While the new furnace will not be completed and put in blast this year, it is regarded as evidence of confidence in continued prosperity in the iron and steel trade. The new furnace will be 90 ft. high and 22 ft. in diameter at the bosh, and will have a daily capacity of 600 tons. It will cost about $1,000,000.

More new orders for finished steel products have been placed within the past few days than for some time, and with the heavy specifications on old contracts, the steel mills in this district never have been so busy. The Carnegie Steel Co. has been forced to transfer some of its plate orders to the plants of the American Steel & Wire Co. New business is being placed in almost every line, but orders for plates and steel bars are more urgent, and mills are from four to six weeks behind in deliveries. The market is quiet in billets and sheet-bars, and is practically in control of the leading interest. The Billet Association held a meeting in New York on Thursday, but made no change in prices. While $21 is named as the price for bessemer and open-hearth billets, and $23 for sheet and tin-plate bars, the actual price is $24 for billets and $26 to $27 for bars. In order to catch up on deliveries mills are breaking records in every line. Reports show that an unusual record was made at the Homestead works of the Carnegie Steel Co. in March, when 190,000 tons of bessemer and open-hearth ingots were produced. This is at the rate of 2,280,000 tons of steel a year. The structural market shows a marked improvement, and the contracts so far booked will keep all the mills busy for several months. There is no indication of a decline in the heavy business being done in sheets and tin-plate. The American Sheet & Tin Plate Co. has added a new sheet plant to its list. It is the one at South Sharon, which was taken over by the United States Steel Corporation when the plants of the Union-Sharon Steel Co. were bought, two years ago. The sheet plant was turned over to the American Co., equipped with the Bray semi-continuous system and put in operation for the first time. So far it is operating very satisfactorily. A determined effort is being made by the Whitaker-Glessner Co. to operate its sheet and tin-plate plant at Wheeling on a non-union basis. The Amalgamated Association of Iron, Steel and Tin Workers is equally determined that only members of the association shall be employed. A large number of new men have been engaged, but through the interference of the strikers many have been prevented from going to work. The company secured an injunction against the strikers, and in retaliation the strikers brought suit against members of the company for employing armed guards from outside the State in violation of the law. Some Pittsburg policemen had been engaged to guard the works and to assist in bringing men from other cities. The Amalgamated Association failed in its efforts to prevent the hoop management of the Carnegie Steel Co. from operating the plant at Greenville, which was started on Tuesday of last week. The plant is now in full operation, and the company yesterday started the plant at Duncansville, Pa., which had been idle since October, 1903.

Pig Iron.—Sales of pig iron for the week aggregate about 6,000 tons, and prices are firm. There are reports of slight shading, but all lack confirmation. Bessemer is quoted at $15.50@$16. Valley furnaces; foundry No. 2, $16.85@$17.10, Pittsburg, and gray forge, $15.85@$16, Pittsburg.

Steel.—The billet market is quiet, but the demand for finished steel products is very active and prices are firm. Plates continue at 1.60c., and merchant steel bars at 1.50c. Premiums of from $2 to $4 are offered for billets and sheet-bars over the pool price of $21 for billets and $23 for bars.

Sheets.—But little new business has been booked this week. Specifications, however, are heavy, and all the mills are busy. Prices remain unchanged, black sheets, No. 28 gauge, being quoted at 2.40c., and galvanized sheets at 3.45c.

Ferro-Manganese.—The market continues very strong, and $51.50@$52 is quoted for 80%, both foreign and domestic.

Cartagena, Spain. March 25.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that business has been moderate, with no change in prices. It is reported that a large plant is to be put up for briquetting fine ores which are produced in mining. The plant will be worked by electricity obtained from water power. Shipments for the week were one cargo, 3,880 tons manganiferous to Great Britain; one cargo, 4,400 tons magnetic ore to Rotterdam; one cargo, 1,700 tons dry ore to Great Britain, and one cargo, 4,700 tons dry ore to Philadelphia.

Quotations are, f. o. b. shipping port, as follows: Ordinary 50% ore, 6s. 5d.@6s. 8d.; special low phosphorus, 7s. 1d.@7s. 8d.; specular ore, 58%, 9s. 4d. For manganiferous ore quotations vary from 10s. 1d. for 35% iron and 12% manganese, up to 14s. 8d. for 20% iron and 20% manganese.

Iron Pyrite.—Iron pyrite, 40% iron and 43% sulphur, is quoted at 10s. per ton.

Chemicals and Minerals.

NEW YORK, April 12.

There continues to be a good movement in heavy chemicals at firm prices, and occasionally a new contract is booked. An interesting charter noted this week is for a sailing vessel, 1,766 tons, to carry cement from Hamburg, Germany, to Los Angeles, California, at 12s. ($2.88). During January and February, this year, the imports of German cement into the United States amounted to 8,710 short tons, having an average invoice value of $6.04 per ton, which compares with 7,796 tons, $6.07 per ton in 1904. The nearest competitor, Belgium, exported to America in the two months this year, 11,491 tons, having an average value of $6.43 per ton, which compares with 16,269 tons, $5.81 per ton in 1904. Germany and Belgium together furnish about 85% of the foreign cement consumed in America.

The foreign trade of the United States in February is shown below:

Imports.	February.	Jan.-Feb.
Asphalt, tons	4,437	10,971
Bleaching powder, lb.	6,527,315	13,978,569
Cement, lb.	13,101,552	47,705,352
Clays or earths, tons	16,899	34,638
Graphite, tons	1,548	2,601
Potash, chlorate, lb.	2,240	3,367
Potash, muriate, lb.	5,002,384	31,358,457
Potash, nitrate, lb	813,343	1,301,681
Potash, all other, lb.	7,241,560	14,655,012
Salt, lb.	21,494,587	43,027,912
Soda, ash, lb.	990,938	2,672,996
Soda, caustic, lb.	223,454	372,043
Soda, sal, lb.	78,400	406,995
Soda, other (not nitrate) lb.	866,579	2,088,536
Re-exports.		
Asphalt, tons	1	19
Potash, muriate, lb.	44,800	612,301
Potash, nitrate, lb.	....	380,134
Potash, all other lb.	560	560
Soda ash, lb.	1,598	1,598
Soda, caustic, lb	44,618	113,231

Domestic exports for the two months were:

	1904.	1905.
Ashes, pot and pearl, lb.	212,099	88,128
Cement, bbl.	23,006	80,254
Gunpowder, lb.	45,875	103,410
Lime, bbl.	6,218	11,300
Lime acetate, lb.	10,849,224	8,992,264
Salt, lb.	2,673,729	8,106,363

Notable changes in domestic exports this year were increases of 57,248 bbl. cement, 57,535 lb. gunpowder, and 5,432,634 lb. salt.

Copper Sulphate.—So long as the metal market shows signs of higher prices makers of copper sulphate will recognize their advantage. This week quotations are $4.75 @$5 per 100 lb., and exhibit the tendency to rise.

Acids.—The position of most commercial acids is unchanged from last week, deliveries on contract being moderate, and prices firm. Sellers of oxalic acid are again at cross-play.

Nitric acid, 36°, 100 lb.	$5.00
38°, 100 lb.	5.25
40°, 100 lb.	5.50
42°, 100 lb.	5.75
Oxalic acid, com'l, 100 lb.	$5.00@ 5.25
Sulphuric acid, 50°, bulk, ton	13.50@14.50
60°, 100 lb. in carboys	1.05
60°, bulk, ton	18.00@20.00
66°, 100 lb. in carboys	1.20
66° bulk, ton	21.00@23.00

Sulphur and Pyrite.—Domestic brimstone is in good demand, but sellers of Sicilian are still "at sea." Reports are current of the discovery of sulphur on the Frank Parlett feldspar property near Woodstock, Howard county, Md. It is also learned that Americans are developing a sulphur mine at Soufrière, Dominica. Louisiana prime sulphur, f. o. b. New York and Portland, Me., is quoted at $21.25 per ton, and seconds at $20.95. At Philadelphia and Baltimore quotations are 15c. per ton higher. Foreign best unmixed seconds are nominal at $21.25. Pyrite is in fair request. Completed figures show that the Rio Tinto Co. exported to the United States last year 144,840 tons copper pyrite; to Germany, 275,530 tons; to Great Britain, 243,374 tons; making a total of 663,744 tons, carrying an average of about 2.34% copper. There was also delivered during the year 157,810 tons sulphur ore, and to encourage its consumption the company has become interested in the manufacture of superphosphate in Spain. In 1903 the exports of pyrite by the company totaled 667,748 tons, and of sulphur ore, 118,174 tons, showing that while the quantity of the former has decreased, the latter increased. We quote foreign pyrite, f. o. b. Atlantic ports, as follows: Unwashed lump ore, 10.5@11c. per unit of sulphur (varying from 48@52%); washed lump, 10@10.5c.; broken to furnace size, 25c. per ton extra; unwashed fines, 9.5@10c.; washed fines, 8@8.5c. Domestic pyrite, containing 38@46% sulphur, is quoted f. o. b. Atlantic coast mines at 9@10c. per unit for lump, and 8.5@9.5c. for fines.

Imports of pyrite into the United States from January 1 to March 31 are reported by Ladenburg, Thalmann & Co. as 131,000 tons.

Nitrate of Soda.—The market continues firm. Spot and nearby 96% grade is worth $2.45@$2.50 per 100 lb., while shipments are quoted at $2.25@$2.35, according to position. Ordinary quality is quoted 2.5@5c. per 100 lb. below refined.

Chilean Nitrate of Soda Market.—Messrs. Jackson Bros., of Valparaiso, write under date of March 4 that the market is decidedly weaker, sales being effected of 95% for March-May delivery at 7s. 5d.@7s. 4¼d. alongside, and for August-December at 7s. 5d. In the refined quality little has been done, 7s. 9½d. being paid for February delivery. Production in the two months ending Feb. 28 was 6,483,399 qtl. (4,503,389 qtl. in 1904); exports, 6,319,250 qtl. (5,443,105 qtl. in 1904); consumption, 6,847,206 qtl. (7,537,428 qtl. in 1904). We quote 95%, March, 7s. 4½d., April-June 7s. 5d., July-December 7s. 5½d., all alongside sellers.

Sulphate of Ammonia.—While the market continues steady in tone, prices for good gas liquor are quoted at $3.15@$3.17 per 100 lb., according to time of delivery.

Phosphates.—One of the interesting features is the expansion in the shipments from South Carolina, amounting in the seven months ending March 31 to 23,895 tars crude rock, and 37,530 tars acid phosphate. The phosphate rock was taken almost entirely by Maryland, New Jersey and Massachusetts, while the superphosphate went principally to Norfolk, Va. Prices for South Carolina phosphate rock are higher. In Florida and Tennessee mining is active, and judging from orders placed, prices will continue to stiffen.

Exports of Florida phosphate rock through Savannah in March amounted to 22,719 tons, making for the quarter 53,807 tons, chiefly to Germany.

Phosphates.	F. o. b.	C. I. F. Gt. Britain or Europe.
*Fla., hard rock	$7.25@7.50	$10.67@11.85
land pebble.	3.75@4.00	7.70@ 8.40
†Tenn., 78@80%	4.35@4.40	10.27@10.67
78%	3.75@4 00	.....
75%	3.40@3.50	.....
68@72%	3.00@3.25	.....
‡So. Car. land rock	3.75@4 00	.....
river rock	3.50@3.75	6.33@ 6.61
Algerian, 63@70%	.....	7.04@ 7.71
58@63%	.....	6.15@ 6.60
Tunis (Gafsa)	.....	6.00@ 6.60
Christmas Isle	.....	13.28@14.11
Ocean Isle	.....	13.60@14.45
Somme, Fr	.....	11.39
Basic slag, 42@50%	.....	10.21@10.44
38@45%	.....	9.48@ 9.72
30@35%	.....	7.78@ 7.90

*F. o. b. Florida or Georgia ports. † F. o. b. Mt. Pleasant. ‡ On vessel Ashley River, S. C.

Liverpool. March 29.

Messrs. Joseph P. Brunner & Co. write that the export demand for heavy chemicals is quiet, while prices are mostly without change.

Soda ash is firm. For tierces the nearest range about as follows: Leblanc ash, 48%, £5@£5 10s.; 58%, £5 10s.@£6 per ton, net cash. Ammonia ash, 48%, £4 5s.@£4 10s.; 58%, £4 10s.@£4 15s. Bags, 5s. per ton under price for tierces. Soda crystals are in good jobbing demand at generally £3 7s. 6d. per ton, less 5% for barrels, or 7s. less for bags, with special terms for a few favored markets. Caustic soda receives a fair amount of attention from buyers and prices are steadily maintained as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash.

Bleaching powder is slow of sale at nominally £4 15s.@£5 per ton, net cash, for hardwood as to market.

Sulphate of ammonia is rather easier at about £12 16s. 3d.@£12 18s. 9d. per ton, less 2½% for good gray 24@25% in double bags f. o. b. here.

Bicarbonate of soda is in fair demand at £6 15s. per ton, less 2½% for the finest quality in 1 cwt. kegs, with usual allowances for larger packages, also special terms for a few favored markets.

Nitrate of soda is better this week and on spot holders quote £11 2s. 6d. per ton for ordinary, up to £11 7s. 6d. per ton for refined, for double bags f. o. b. here, less 2½ per cent.

Metal Market.

New York, April 12.

Gold and Silver Exports and Imports.

At all United States Ports in February and Year.

Metal.	February.		Year.	
	1904.	1905.	1904.	1905.
G'ld				
Exp	$732,614	$14,794,312	$1,324,181	$31,621 480
Imp	5,034,372	2,190,980	13,259,880	4,086,671
Exc	I. $4,301,758	E$12,603,332	I.$11,935,699	E$27,535,809
Silv				
Exp	3,940,577	4,036,075	8,927,471	8,400,820
Imp	2,106,675	2,063,293	4,716,047	3,985,495
Exc	E. $1,833,902	E. $1,972,782	E. $4,211,424	E. $4,415,335

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending April 8 and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week...	$4,000	$71,715	362,567	215,553
1905....	31,939,270	4,045,826	9,697,608	892,990
1904....	5,173,267	1,556,923	12,949,545	207,661
1903....	1,315,951	2,505,897	5,347,870	336,197

The gold movement was principally with Central and South America and the West Indies; of silver with London and Panama.

General business continues in good condition. Foreign exchange is strong, and there is no talk of gold exports.

The statement of the New York banks—including the 53 banks represented in the Clearing House—for the week ending April 8, gives the following totals, comparison being made with the corresponding week of 1904:

	1904.	1905.
Loans and discounts	$1,038,533,000	$1,090,759,600
Deposits	1,085,512,800	1,128,100,700
Circulation	35,622,800	44,120,400
Specie	233,101,400	208,035,200
Legal tenders	71,193,200	82,672,500
Total reserve.	$304,294,600	$290,707,700
Legal requirements.	271,378,200	282,025,175
Balance surplus	$32,916,400	$8,682,525

Changes for the week were increases of $401,700 in circulation and $17,950 in surplus reserve; decreases of $8,530,900 in loans and discounts, $10,560,600 in deposits, $1,445,900 in specie, and $1,176,300 in legal tenders.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver.
New York	$208,035,200	.....
England.	193,723,345	.....
France	553,601,990	$219,969,890
Germany	189,225,000	64,745,000
Spain	74,315,000	105,080,000
Netherlands	30,006,500	31,708,000
Belgium.	15,966,665	7,983,335
Italy.	112,145,000	17,422,000
Russia	504,665,000	33,670,000
Austria	238,615,000	65,215,000

The returns of the Associated Banks of New York are of date April 8, and the others April 6, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market has had some check to the decline, owing to speculative purchases in London, based on the idea that inquiries for silver are likely to be a little larger. The quotation closes at 26¼d., London.

The United States Assay Office in New York reports receipts of 63,000 oz. of silver for the week.

Shipments of silver from London to the East for the year up to March 30 are reported by Messrs. Pixley & Abell's circular as follows:

	1904.	1905.	Changes.
India	£3,318,839	£2,065,787	D. £1,253,052
China	71,000	1,370	D. 69,630
Straits	58,103	2,800	D. 55,303
Totals	£3 447,942	£2,069,957	D. £1,377,985

Receipts for the week were £207,000 in bar silver from New York, £4,000 from Australia, and £3,000 from Chile; total, £214,000. Shipments were £109,500 in bar silver to Bombay.

Indian exchange is rather easier, as money is abundant in India, and exports have been falling off. The Council bills offered in London sold at an average of 16d. per rupee. There has been very little demand for silver for India, but some purchases on Chinese account have been noted.

In the year ending March 31 the total amount of Council bills disposed of in London was 365,357,363 rupees, or a little over 36½ crores. The average rate was 16.0449d. per rupee, the sum received in London being £24,425,567 sterling.

The movement of gold in France for the two months ending Feb. 28 is reported as follows:

	1904.	1905.
Imports	Fr.32,630,000	Fr.130,972,000
Exports	4,196,000	17,328,000
Excess	8,434,000	113,644,000

Imports of gold have been large this year. The movement of silver for the two months was as follows:

	1904.	1905.
Imports	Fr.19,153,000	Fr.13,436,000
Exports	24,361,000	16,187,000
Excess, exports	5,208,000	2,751,000

Imports of copper and nickel coins, rated at their face value, were 15,000 fr. in 1904 and 40,000 fr. in 1905.

Prices of Foreign Coins.

	Bid.	Asked
Mexican dollars	$0.44	$0.48
Peruvian soles and Chilean pesos	.40	44
Victoria sovereigns	4.85	4.87
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	4.82

Other Metals.

Daily Prices of Metals in New York.

April.	Copper. Lake, Cts. per lb.	Copper. Electrolytic Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
6	15 @15¼	14⅞ @15⅛	67½	30½	4.50	5.85	5.70
7	15 @15¼	14⅞ @15⅛	67	30½	4.50	5.85	5.70
8	15 @15¼	14⅞ @15⅛	.....	30½	4.50	5.85	5.70
10	15 @15¼	14⅞ @15⅛	67½	30¾	4.50	5.85	5.70
11	15 @15¼	14⅞ @15⅛	67½	31	4.50	5.85	5.70
12	15 @15¼	14⅞ @15⅛	67¾	31	4.50	5.85	5.70

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of Cathodes is usually 0.25c. below that of lectrolytic copper.

SILVER AND STERLING EXCHANGE.

April.	Sterling Exchange.	Silver. New York Cents.	Silver. London. Pence.	April.	Sterling Exchange.	Silver. New York. Cents.	Silver. London, Pence.
6	4.86	55	25 1/16	10	4.8615	56	25⅞
7	4.86½	55⅛	25 1/16	11	4.8615	56⅛	26⅛
8	4.86½	55⅛	25⅛	12	4.86½	56⅛	26⅛

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Owing to a misprint which was not detected by the proofreader, the average price of Lake copper for March was given last week as 15.150c.; the correct figure is 15.250c., as given this week. For the same reason, the price of silver in New York on April 4 was given as 55c.; the correct figure is 56c. We regret these errors, which were due to confusion in the printing office.

Copper.—The past week has been rather featureless. Consumers are still indifferent toward the market, but about the end of the week some interest was shown by European buyers and sales for export are reported at the ruling prices. The closing quotations are unchanged at 15@15¼ for Lake copper; 14⅞@15⅛ for electrolytic in ingots, cakes and wirebars, 14⅝@14⅞ in cathodes; 14½@14¾ for casting copper.

The standard market ruled about unchanged for the remainde rof last week. However, since the beginning of this week there has been a recovery, the closing quotations on Wednesday being cabled as £67 7s. 6d. for spot, £67 15s. for three months.

Refined and manufactured sorts we quote: English tough, £70 10s@£71; best selected, £71 15s@£72 5s.; strong sheets, £79 10s.; India sheets, £75 10s.; yellow metal, 6⅝d.

Exports of copper from New York and Baltimore for the week ending April 11 were 2,439 long tons. Imports for the week of April 7 were 190 tons copper and $30,892 worth of ore (quantity not given).

Tin.—In sympathy with the movement abroad there has been a further advance in the price of spot metal, but there is no business at all in future deliveries. Quotations at the close are 31c. for spot, 29¾@30c. for futures.

The London market, which closed at £141 for spot, £135 5s. for three months, opened on Monday at £141 10s. for spot, £135 15s. for three months. The manipulation in the spot position has produced a further advance, and the closing quotations on Wednesday are cabled at £144 15s. for spot, £136 for three months.

Lead.—Demand continues in satisfactory volume. The closing quotations are unchanged at $4.42½ St. Louis, $4.50 New York.

Since our last report the export business abroad has broadened, still further, the quotations advancing at the close to £12 16s. 3d. for Spanish lead, £12 18s. 9d. for English lead.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 25, that silver has been 14 reales per oz. Exchange is 33.46 pesetas to £1. Local price for pig lead has been 67.75 reales per quintal, which, on current exchange, is equal to £11 6s. 8d. per long ton, f. o. b. Cartagena. Exports were 294 tons argentiferous and 128 tons desilverized to Marseilles.

Spelter.—The market has again relapsed into dullness. However, there is no disposition to shade present figures, which leave a very small margin on the price of ore. The closing quotations are unchanged at 5.70 St. Louis, 5.85 New York.

There is no marked change abroad, the last quotations on Wednesday being cabled at £23 12s. 6d. for good ordinaries, £23 17s. 6d. for specials.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: There is no change in the spelter market to speak of. Demand is fairly good, on the basis of 5.77½@5.80c. for April and May delivery. Offerings are light an dabout equal to the demand.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 25, that local conditions continue good. Quotations are 74 fr. per ton for blende, 35% zinc, and 54 fr. for calamine, 30% zinc. Shipments for the week were 1,728 tons blende to Antwerp, 1,100 tons blende and 500 tons calamine to Stettin. The export of blende from Spain for the year 1904 was 101,543 tons, an increase of 7,664 tons. Exports of calamine were 34,936 tons, an increase of 7,049 tons over the previous year.

Silesian Spelter Market.—Herr Paul Speier writes from Breslau, under date of March 28, that consumption is rather stationary. There has been less speculation, but prices remain fairly steady. The current quotation for ordinary brands is 24.50 marks per 50 kg., f. o. b. cars, Breslau. This is equal to 5.29c. per lb., New York. Zinc dust is rather heavy. The price for export is somewhat lower, freight to Stettin having been reduced: Exports for the two months ending Feb. 28 included 10,343 tons of spelter, 2,761 tons of zinc sheets, 781 tons of zinc scrap, and 2,432 tons of zinc white. Imports of ores this year were 22,486 tons.

Antimony.—The market is quite active at around 8c. New York for the common brands.

Imports of antimony into the United States for the two months ending February 28 were as follows, in pounds:

	1904.	1905.	Changes.
Metal and regulus	585,616	696,544	I. 110,928
Antimony ore	654,560	730,600	I. 76,040

Nickel.—Producers quote 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order.

Platinum.—Quotations are firm at $20.50 per oz. Gas engine sparking points vary from 87c. each for "A," to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated ware, 90c., and cones, $1 per gram.

Quicksilver.—Quicksilver is easy at $38 @$38.50 per flask in large lots, while $40 is the price for smaller orders. San Francisco prices are $37.50@$38 per flask for domestic orders, with some discount for export. The London price is lower, at £7 12s. 6d., with the same figures quoted by second hands.

Cadmium.—Metallic cadmium, guaranteed 99.5%, is selling in quantities of 100 kgs. or over at 710 marks per 100 kgs., packing included, f. o. b. Hamburg. This is equivalent to 76.6c. per lb. Prices are for net cash.

Minor Metals and Alloys.—Prices for manganese alloys in Germany are given by Herr Paul Speier as below. The prices are for orders of not less than 500 kgs., de-

livered in Bremen, and are as follows per 100 kgs.: Manganese copper, No. 1, guaranteed 30% manganese, 265 marks; No. 2, 28 to 30% manganese, for bronze, etc., 175 marks; No. 3, 25 to 20% manganese, with 2 to 4% iron, 165 marks. Manganese tin, No. 1, free of iron and guaranteed 55% manganese, 365 marks; No. 2, 55% manganese, with some iron, 225 marks. Manganese nickel, No. 1, free of iron, 450 marks; No. 2, carrying some iron, 270 marks.

Thallium is quoted at 60@65 marks per kg. at Breslau, Germany. Manganese metal is quoted at 360 marks per 100 kg., f. o. b. Bremen, Germany.

For other minor metals and their alloys, wholesale prices are, f. o. b. works:

	Per lb.
Aluminum.	
No. 1, 99% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled Sheets	4c. up.
Aluminum-Bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	$1.00
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (74%)	12½c.
Ferro-Tungsten (37%)	45c.
Magnesium, pure (N. Y.)	$1.60
Manganese (98@99% N. Y.)	75c.
Manganese Cu. (30@70% N. Y.)	40c.
Molybdenum (98@99% N. Y.)	$2.75
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best)	$1.25

Variations in prices depend chiefly upon the size and conditions of orders.

Missouri Ore Market.

JOPLIN, April 8.

The highest price paid for zinc ore was $45 per ton, the same as the previous week, but the assay price was advanced $1 per ton on about 1,000 tons, the purchasing agents of one of the smelters having early orders for a large increase in purchases. With a very small reserve stock in the bins, and this pretty closely bought up, an advance in prices was necessary to secure any promise of ore, and to obtain all the ore wanted a part of the output of the following week has been contracted for in advance—before it is mined—a very unusual occurrence here. The assay basis price ranged from $39 for some inferior ore, to $43 per ton of 60% zinc. Lead was purchased all week by the local lead smelter at $58 per ton, but the purchasing agent of the St. Louis Smelting & Refining Co. bought a couple of cars for next week's delivery at $58.50 per ton. A year ago zinc sold at $39 per ton for the very choicest grades, and lead was quoted $60 per ton.

Following are the shipments of zinc and lead ore from the various camps of the Joplin district:

	Zinc, lb.	Lead, lb.	Value.
Webb City & Carterville	2,868,460	593,350	$74,580
Joplin	2,853,150	190,770	68,300
Galena-Empire	1,073,210	64,650	23,880
Duenweg	561,630	64,480	13,660
Badger	596,610	5,960	13,000
Aurora	469,200	.....	9,990
Alba	450,090	17,960	9,760
Neck City	348,990	26,400	8,440
Oronogo	333,220	12,110	7,005
Prosperity	287,230	24,650	6,740
Carthage	289,720	.....	5,790
Zincite	172,750	1,110	3,660
Baxter	115,380	6,550	2,440
Spurgeon	208,680	.....	5,090
Mitchell	72,430	.....	1,520
Beef Branch	89,440	25,590	1,450
Diamond	65,610	.....	1,380
Reeds	64,060	.....	1,280
Lawton	40,300	.....	800
Totals	10,960,160	1,033,580	$258,765
Totals 14 weeks	124,845,630	14,736,620	$3,423,740
Zinc value, the week, $228,905; 14 weeks,			$2,996,445
Lead value, the week,	29,860; 14 weeks,		427,295

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.055	60.690	26.423	27.930
February	57.592	61.023	26.665	28.047
March	56.741	58.046	26.164	26.794
April	54.202	.....	24.974	.....
May	55.430	.....	25.578	.....
June	55.673	.....	25.644	.....
July	58.095	.....	26.760	.....
August	57.806	.....	26.591	.....
September	57.120	.....	26.349	.....
October	57.923	.....	26.760	.....
November	58.453	.....	26.952	.....
December	60.563	.....	27.930	.....
Year	57.221	.....	26.399	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

COPPER IN NEW YORK.

Month.	Electrolytic.		Lake.	
	1904.	1905.	1904.	1905.
January	12.410	15.008	12.553	15.128
February	12.062	15.011	12.245	15.136
March	12.299	15.125	12.551	15.250
April	12.923	.....	13.120	.....
May	12.758	.....	13.000	.....
June	12.269	.....	12.399	.....
July	12.380	.....	12.505	.....
August	12.343	.....	12.468	.....
September	12.495	.....	12.620	.....
October	12.993	.....	13.118	.....
November	14.284	.....	14.456	.....
December	14.661	.....	14.849	.....
Year	12.823	.....	12.990	.....

Prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower.

COPPER IN LONDON.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	57.500	68.262	July	57.256	.....
Feb	56.500	67.963	August	56.952	.....
March	57.321	68.174	Sept	57.645	.....
April	58.247	.....	Oct	60.012	.....
May	57.321	.....	Nov	65.085	.....
June	56.398	.....	Dec	66.384	.....
			Av., year	58.857	.....

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	28.845	29.325	July	26.573	.....
Feb	28.087	29.262	August	27.012	.....
March	28.317	29.523	Sept	27.780	.....
April	28.132	.....	Oct	28.596	.....
May	27.718	.....	Nov	29.185	.....
June	26.325	.....	Dec	29.286	.....
			Av., year	27.986	.....

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	4.347	4.552	July	4.192	.....
Feb	4.375	4.450	August	4.111	.....
March	4.475	4.470	Sept	4.200	.....
April	4.475	.....	Oct	4.200	.....
May	4.423	.....	Nov	4.200	.....
June	4.496	.....	Dec	4.600	.....
			Av., year	4.309	.....

SPELTER.

Month.	New York.		St. Louis.	
	1904.	1905.	1904.	1905.
January	4.863	6.190	4.673	6.032
February	4.916	6.139	4.717	5.989
March	5.057	6.067	4.841	5.917
April	5.219	.....	5.038	.....
May	5.031	.....	4.853	.....
June	4.760	.....	4.596	.....
July	4.873	.....	4.723	.....
August	4.866	.....	4.716	.....
September	5.046	.....	4.896	.....
October	5.181	.....	5.033	.....
November	5.513	.....	5.363	.....
December	5.872	.....	5.720	.....
Year	5.100	.....	4.931	.....

Dividends.

Company.	Payable.	Rate.	Amount.
†Am. Agri. Chem., pf.	Apr. 1	$.30	$544,050
†Am. Sm. & Ref., com.	Apr. 15	1.25	625,000
†Am. Sm. & Ref., pf.	Apr. 1	1.75	875,000
†Boston & Oroville, Cal.	Apr. 1	.25	125,000
*Bunker Hill & Sull	Apr. 4	.25	75,000
*Caribou Oil, Cal	Apr. 15	.07	5,600
†Central Coal & C., com.	Apr. 15	1.50	76,875
†Central Coal & C., pf.	Apr. 15	1.25	23,438
*Central Eureka, Cal	Apr. 8	.07	5,000
*Claremont Oil, Cal	Apr. 1	.01	4,500
†Cop. Range Con., Mich.	Apr. 1	1.00	383,781
†Doe Run Lead, Mo.	Apr. 15	1.50	22,500
*Dos Estrellas, Mex.	Apr. 15	13.73	41,190
*Four Oil, Cal	Apr. 15	.01	3,000
†General Chemical, pf	Apr. 1	1.50	150,000
Greene Con. Copper	Apr. 20	.40	345,600
†Guggenheim. Expl	Apr. 1	1.75	183,750
*Hecla, Ida	Apr. 20	.01	10,000
Iron Silver, Colo	May 1	.10	50,000
†Jamison, Cal	Apr. 18	.03	11,700
*Kendall, Mont	Apr. 20	.05	25,000
La Belle Iron Works, O.	May 1	1.50	105,000
*Lightner, Cal	Apr. 20	.05	5,113
*Mines Co. of Am	Apr. 20	.01½	30,000
*Monte Cristo Oil, Cal	Apr. 10	.01	5,000
New Central Coal, Md	May. 1	.40	20,000
*New Century Zinc	Apr. 1	.01	1,500
‡New Haven I. & St.	Apr. 6	.15	15,000
New Idria Quicksilver	Apr. 1	.30	30,000
*Oil City Petroleum.	Apr. 15	.00½	2,500
*Penna. Con., Cal.	Apr. 15	.10	5,150
Penna.-Salt.	Apr. 15	3.00	118,000
*Peerless Oil, Cal	Apr. 1	.14	12,880
†Phila. Gas, com.	May 1	.75	398,888
†Pittsburg Coal, pf.	Apr. 25	1.75	519,771
Pittsburg Oil & Gas	Apr. 15	1.00	.....
*Pocahontas Coll., pf.	Apr. 1	.50	7,500
*Providencia, Mex	Apr. 1	.87	5,220
Reed Oil, Cal.	Apr. 1	1.05	105,000
†Rock Run Fuel Gas Pa.	May 1	1.75	.....
*San Rafael, aviador	Apr. 19	12.18	14,616
*San Rafael, aviado.	Apr. 19	3.48	4,176
‡Sloss-Sheffield St. &I., c.	Apr. 3	2.50	187,500
†Sloss-Sheffield, pf	Apr. 3	1.75	117,250
*Soledad, Mex	Apr. 19	8.70	8,352
†Spearfish, S. D	Apr. 15	.01½	22,500
†Tenn. C. & I., com	May 1	1.00	225,536
*Thirty-three Oil, Cal	Apr. 6	.10	10,000
*Twenty-eight Oil, Cal.	Apr. 15	.15	9,000
*Union Oil, Cal.	Apr. 20	.50	26,336
†United (Cripple C'k)	Apr. 5	.00½	20,046
†United Gas Imp	Apr. 15	2.00	180,000
*United Petroleum, Cal.	Apr. 20	.80	11,744
†United Zinc, pf.	Apr. 15	.75	14,667
†Va.-Carolina Chem., pf.	Apr. 15	2.00	360,000
Westmoreland Coal	Apr. 1	2.50	150,000
‡Wolverine, Mich.	Apr. 1	5.00	300,000

*Monthly. †Quarterly. ‡Semi-Annually.

Assessments.

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev.	May 4	.....	.05
Alta-Sierra, Cal.	Mar. 27	Apr. 17	.30
Caledonia, Nev	Apr. 19	May 10	.10
Centennial Copper, Mich	Aug. 10	.....	2.00
Diamond Creek, Cal.	May 13	.....	.01½
Emerald, Utah	May 14	June 10	.01½
Golden West, Cal	Apr. 17	May 13	.01
Holland, Utah	Apr. 19	May 8	.04
Jubilee, Cal	Apr. 24	.....	.10
Marina Marsicano.	Mar. 29	Apr. 24	.10
Mexican, Nev	Apr. 11	May 2	.15
Republic, Cal	May 3	.....	.02½
Savage, Nev	Apr. 7	Apr. 27	.10
Socrates Con., Cal.	May 1	.....	.02½
St. John Con. quicksilver	May 8	.....	.10
Yellow Jacket, Nev	Apr. 11	May 16	.10

Colorado Springs (By Telegraph.)

Company.	April 10.		April 11.	
	H.	L.	H.	L.
Anaconda	.18	.15	.17	.15½
C. K. & N.	.17	.12	.17	.12
Cripple Creek Con.	.10¼	.10¼	.10¼	.10¼
Doctor Jack Pot	.03¼	.03¼	.03¼	.03
Elkton	.52½	.52	.53½	.53
El Paso	2.20	2.15½	2.18	2.16
Isabella	.28½	.28	.29	.28
Moon Anchor	.06	.05	.06	.05
Old Gold	.07½	.07	.07½	.06½
Portland	2.20	2.00	2.18	2.10
Vindicator Con	.88	.87	.90	.86
Work	.13	.12½	.12½	.12

STOCK QUOTATIONS.

Salt Lake City. April 7.

Company.	Par Val.	High.	Low.	Shares
Beck-Tunnel	$1	9	9	500
Butler Liberal	1	13¾	13½	8,500
Carisa	1	13	12	3,100
Columbus Con	....	1.15	1.15	800
Con. Mercur	....	36	36	1,000
Daly	20	2.35	2.25	200
Daly-Judge	....	6.85	6.30	100
Ingot	1	2¼	2¼	9,000
Little Chief	1	4¼	4	52,500
Lo. Mammoth	25	17	11½	29,100
Mammoth	1	1.12	1.10	400
May Day	25	33	20	75,700
New York Bonanza	1	53¾	49½	8,550
Ontario	....	3.10	2.90	600
Sacramento	....	8½	8¼	4,000
Silver Shield	....	39	36½	8,000
Star Con	1	12½	12½	1,000
Tetro	1	19¼	19½	1,500
Thompson	....	10	10	5,500
Uncle Sam Con	1	37	35	1,000
Victor Con	....	4½	4¼	5,000
Yankee Con	....	39	40	2,900

Total sales, 218,950 shares.

St. Louis, Mo.* April 9.

Company.	Par Val.	Bid.	Ask.
Am. Nettie, Colo	$10	$0.10	$0.25
Center Creek	10	1.50	1.70
Central Coal & C	100	68.00	70.00
Central C & C., Pf	100	78.75	80.50
Central Lead, Mo	100	120.00	125.00
Columbia Lead, Mo	10	.25	1.75
Con. Coal, Ill	100	31.00	.....
Doe Run Lead, Mo	100	117.50	120.00
Granite Bimet., Mont	10	.35	.37
St. Joe Lead, Mo	10	16.00	18.00

*By our Special Correspondent.

Montreal.* April 8.

Company.	Par Val.	High.	Low.
Dominion Coal	$100	82.87½	80.00
Dominion Coal, Pf	100	.....	.....
Dom. I. & St.	100	23.00	22.62½
Dom. I. & St., Pf	100	69.00	68.00
Montreal Steel	100	.....	.....
Nova Scotia St.	100	65.50	.....
N. S. Steel, Pf	100	.....	.....

*Montreal Stock Exchange.

San Francisco.* April 6.

Company.	Location.	Opening. H.	Opening. L.	Closing. H.	Closing. L.	Sales.
MacNamara	Nev.	.55	.49	.52	.48	69,700
Mont. Tonopah	Nev.	3.25	3.17½	3.50	....	22,500
Ton. Belmont	Nev.	1.35	....	1.52½	....	12,550
Ton. Midway	Nev.	1.62½	....	1.75	1.71	,900
Ton. Mg. Co	Nev.	15.50	15.00	....	....	250
Ton. North Star	Nev.	60.00	56.00	66.00	....	28,200

* San Francisco & Tonopah Exchange.
Total sales, 139,100 shares.

San Francisco (By Telegraph.)

Company.	April 10	April 11
Belcher	.25	.23
Best & Belcher	1.80	1.70
Caledonia	.49	.54
Challenge Con	.16	.17
Chollar	.18	.17
Confidence	.72	.75
Con. California & Virginia	2.00	1.80
Crown Point	.11	.13
Gould & Curry	.31	.30
Hale & Norcross	.88	.87
Mexican	2.50	2.30
Ophir	11.75	10.25
Overman	.17	.16
Sierra Nevada	.49	.44
Union Con	.85	.74
Yellow Jacket	.25	.23

New York.

Company.	Val.	Apr. 5 H.	Apr. 5 L.	Apr. 6 H.	Apr. 6 L.	Apr. 7 H.	Apr. 7 L.	Apr. 8 H.	Apr. 8 L.	Apr. 10 H.	Apr. 10 L.	Apr. 11 H.	Apr. 11 L.	Sales.
Alice	$25	.65	....	....	....	.65	.45	....	....	....	....	....	....	1,200
Amalgamated	100	81½	80½	83¾	82	83⅜	82⅜	84¼	83	87½	84¼	87½	86	745,622
Anaconda	25	29½	29½	30 1/16	29¾	30 1/16	30½	31	30⅜	31½	30 1/16	31½	31	290,050
Best & Belcher	3	....	....	....	....	....	....	....	....	....	....	....	....	.....
Brunswick	1	....	....	....	....	....	....	....	....	....	....	....	....	.....
Bullion	1	....	....	....	....	....	....	....	....	.37	.36	....	....	500
Caledonia	1	....	....	....	....	.52	.50	....	....	....	....	....	....	200
Chollar	2½	....	....	....	....	....	....	....	....	.20	....	.20	.19	900
Confidence	3	....	....	....	....	....	....	....	....	....	....	....	....	1,100
Consolidated Cal. & Va	2½	1.65	1.60	....	....	1.80	1.75	2.00	1.95	....	....	....	....	.....
Crown Point	1	....	....	.09	....	....	....	....	....	....	....	....	....	20
Elkton Consolidated	1	....	....	....	....	.68	.50	....	....	.50	....	.53	.52	1,200
Federal Mining and Smelting	100	112	....	126	112½	128	123	123½	123	124¼	123½	....	....	9,914
Preferred	100	103	99½	105½	103½	107½	105½	105½	104½	105	104	104½	103	40,700
Gould & Curry	1	.20	....	....	....	....	....	....	....	.35	....	....	....	700
Greene Consolidated Copper	10	28½	28½	29⅜	28½	30	29⅜	29½	29½	30⅜	29½	30⅜	29⅜	27,900
Greene Consolidated Gold	10	7½	7½	7½	7½	7½	7½	7½	....	7½	7½	7½	7½	7,200
Hale & Norcross	3	80	....	....	....	....	....	....	....	....	....	....	....	100
Homestake	100	....	....	....	....	....	....	....	....	79	....	....	....	250
Horn Silver	20	....	....	....	....	....	....	....	....	....	....	....	....	.....
Iron Silver	20	....	....	....	....	....	....	....	....	3.50	....	3.50	....	100
Isabella	1	.33	.32	....	....	....	....	.30	.29	....	....	....	....	900
Leadville	10	.08	.07	.08	....	....	....	.08	....	....	....	....	....	1,700
Little Chief	20	....	....	....	....	....	....	....	....	....	....	....	....	.....
Mexican	3	1.65	....	1.65	....	2.15	2.05	2.25	....	....	....	2.60	....	1,100
Mollie Gibson	5	....	....	....	....	....	....	....	....	05½	....	....	....	500
Ontario	100	....	....	....	....	....	....	....	....	....	....	....	....	.....
Ophir	3	8.00	....	8.50	....	9.50	8.50	10.75	10.50	11.50	....	11.50	....	2,200
Overman	2	....	....	....	....	.16	....	.18	....	....	....	....	....	700
Phoenix	1	.06½	.06	.06	....	....	....	....	....	7	....	....	....	1,650
Portland	1	2.40	....	2.40	....	....	....	....	....	....	....	....	....	200
Potosi	1	....	....	....	....	....	....	.13	....	....	....	.15	....	1,000
Quicksilver	100	....	....	....	....	....	....	....	....	....	....	....	....	.....
Quicksilver, pf	100	....	....	....	....	....	....	....	....	....	....	....	....	.....
Savage	3	....	....	.15	.14	....	....	....	....	.35	.34	....	....	900
Sierra Nevada	3	.43	.42	....	....	....	....	.53	....	.63	....	....	....	400
Silver Hill	10	.64	....	....	....	.63	....	....	....	....	....	....	....	600
Small Hopes	20	....	....	....	....	....	....	....	....	....	....	....	....	.....
Tennessee Copper	25	29½	29	30	....	....	....	30½	....	30½	29	29½	....	1,050
Union Consolidated	1	....	....	....	....	.80	.75	.90	.88	.95	.90	....	....	5,100
United Copper	100	13	11½	13⅜	12	13½	13	14	13½	14¼	13½	14¼	13½	15,956
Yellow Jacket	3	....	....	....	....	.23	....	.23	....	....	....	....	....	300

Total sales, 1,161,907 shares.

Boston.

Company.	Par Val.	Apr. 5 H.	Apr. 5 L.	Apr. 6 H.	Apr. 6 L.	Apr. 7 H.	Apr. 7 L.	Apr. 8 H.	Apr. 8 L.	Apr. 10 H.	Apr. 10 L.	Apr. 11 H.	Apr. 11 L	Sales.
Adventure Con	$25	....	....	5½	5	....	....	5½	....	5½	5	5½	5	885
Allouez	25	21¾	21½	21¾	21¼	22½	21½	21¾	21½	21¾	21	21½	21	2,813
Amalgamated	100	81½	80½	83⅜	81½	83⅜	82⅜	84⅞	83	87⅜	84½	87½	86½	70,346
Am. Z. L. & Sm	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Anaconda	25	....	....	30½	....	....	....	30	....	....	....	31	....	140
Arcadian	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Arnold	25	....	....	....	....	....	....	1½	1	....	....	....	....	30
Ash Bed	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Atlantic	25	16½	16	16½	16	16½	16	16½	16½	16¾	16½	....	....	1,240
Bingham Con	50	31	....	32	31	33	32	33	32½	33¾	32½	33½	33	8,165
Bonanza Dev. Con	10	....	....	....	....	16	....	....	....	....	....	....	....	50
Boston Con	10	7	....	6¾	6½	6½	....	7	6½	7	7½	7½	7½	8,610
Calumet & Hecla	25	675	....	672½	670	670	....	....	....	672½	670	670	....	98
Catalpa	10	....	....	....	....	....	....	....	....	....	....	....	....	.....
Centennial	25	17½	17½	18¼	17	18	16½	17½	17½	20	19½	19	....	5,076
Con. Mercur	5	33	....	....	....	....	....	....	....	35	34	35	....	1,700
Continental Zinc	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Copper Range Con	100	76	75½	77½	75½	77½	76½	77½	76½	78	76½	77½	76½	24,836
Daly West	20	14	13½	14¼	14	14	13½	14	....	14½	14½	14½	14	1,967
Elm River	12	....	....	2¼	....	....	....	....	....	....	....	2½	....	145
Franklin	25	10½	10	10	9½	9½	9⅜	10	9½	10	9½	10	....	1,100
Granby	10	6½	5⅞	6⅜	6	6½	....	6½	6	6⅜	6	6½	6	8,830
Greene Con. Copper	10	28½	28½	29½	28½	29½	29	30	29½	30½	29½	30½	29½	17,931
Guanajuato Con	5	5	4 1/16	5	....	5½	5	....	....	5½	5½	5½	5	3,890
Isle Royale Con	25	....	....	25½	25	25½	25	25	....	25½	25	....	....	555
Mass Con	25	10½	10⅜	11	10⅜	11	10½	10½	10½	11	10½	10½	10⅜	1,991
Mayflower	25	....	....	....	....	....	....	....	....	....	....	90	....	150
Michigan	25	13½	13½	13½	....	14½	13½	13½	13½	14¼	13½	14	13½	1,605
Mohawk	25	53½	53	53½	52½	52⅞	52⅜	53½	52⅜	53	....	53½	52½	2,092
Montana Coal & Coke	25	....	....	3½	3½	3½	3⅜	....	....	3½	3½	3½	3	765
National	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
New Idria	5	....	....	....	....	....	....	....	....	....	....	....	....	.....
Old Colony	25	....	....	....	....	....	....	....	....	1½	....	....	....	50
Old Dominion	25	26½	....	26½	....	27	....	26½	26½	27	....	27	26½	1,495
Osceola	25	98½	97½	100	98	99	98½	99	98	99½	99	99½	99	3,447
Parrot	10	27½	....	29½	27½	28½	....	30	28	30½	29½	30	....	2,727
Phoenix Con	25	1½	....	....	....	1½	....	2	....	2	....	2	....	645
Quincy	25	105	....	....	....	105	....	106	105	107	105½	106½	106	132
Rhode Island	25	....	....	....	....	2	1½	....	....	....	....	....	....	200
Santa Fe	10	....	....	....	....	2	....	2	....	....	....	....	....	510
Shannon	10	7½	7½	8	7½	7½	....	7½	....	7½	7½	7½	....	2,345
Tamarack	25	127	125	130	128	130	128½	129	....	130	....	130	....	324
Tecumseh	25	2½	....	2½	2½	....	....	....	....	....	....	....	....	175
Tennessee	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Trinity	25	10½	10	10½	10	10½	9½	10½	9½	10½	9½	10	9½	9,581
Union Copper Land	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
United Copper Co	100	....	....	....	....	....	....	....	....	....	....	....	....	.....
United States	25	27½	27	28	27½	28½	28	29	28	30½	29½	30½	30	48,503
U. S. Coal & Oil	25	....	....	9½	9½	9½	....	....	....	9½	....	9½	....	650
Utah Con	5	43½	42½	43½	42½	43½	42½	43½	42½	43⅜	43	43	42½	10,062
Victoria	25	4⅜	....	4½	4	....	....	4½	....	4½	....	4½	4	705
Winona	25	13½	....	13¾	....	13½	....	13	....	13	12½	13	....	240
Wolverine	25	110	109½	110	108½	109	108½	108½	....	109½	108½	109½	109½	625
Wyandot	25	....	....	2½	....	2	....	....	....	....	....	....	....	590

Total sales, 248,015 shares.

STOCK QUOTATIONS.

London (By Cable*).

Company.	Apr. 11 £	s.	d.	Company.	Apr. 11 £	s.	d.
Camp Bird	1	14	0	Esperanza	1	0	3
Con. Gold Fields	8	2	6	Modderfontein	10	18	9
De Beers	17	17	6	Rand Mines	11	1	3
Dolores	1	9	0	Rio Tinto	65	6	3
East Rand	8	14	4½	Simmer & Jack	1	1	10½
El Oro	1	2	6	Tomboy	1	3	9

* Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York.

Coal, Iron and Industrial Shares.

Company.	Par Val.	Apr. 5 H.	Apr. 5 L.	Apr. 6 H.	Apr. 6 L.	Apr. 7 H.	Apr. 7 L.	Apr. 8 H.	Apr. 8 L.	Apr. 10 H.	Apr. 10 L.	Apr. 11 H.	Apr. 11 L.	Sales.
Allis-Chalmers	$100	17½	17	17½	17⅜	17¾	17½	17¼	....	17½	16⅜	17½	16½	8,600
Preferred	100	....	....	62	60½	61½	61½	61½	61	62½	61	62	60½	7,600
Am. Agri. Chem.	100	24	....	24½	....	24¾	24½	....	....	24¾	24½	....	....	1,242
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Am. Sm. & Ref.	100	109	104½	111½	109⅜	117¾	109⅜	119	115½	117¾	115½	117	114½	401,780
Preferred	100	126½	123½	127	125⅝	126½	125½	125¼	124	124⅝	124	123⅜	123⅛	16,100
Cambria Iron	50	48½	....	48½	....	....	....	....	....	48½	....	48¼	....	288
Cambria Steel	50	27½	27	27½	27⅜	27⅞	27½	27¼	27½	27⅞	27½	27¾	27	9,456
Col. Fuel & Iron	100	56¾	55⅞	56½	55⅞	56¾	56	56⅝	55½	55⅝	53¾	54½	52½	42,794
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Col. & H. C. & I.	100	16⅜	....	....	....	17	....	16⅞	16⅜	16½	....	....	....	700
General Chem.	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	100	....	....	....	....	....	....	....	....	....	....	101⅝	....	100
Lehigh Nav	50	109	....	110	109¼	110½	110	....	....	109½	109	109	108¾	1,284
Mong. R. Coal	100	....	....	....	....	....	....	9	....	....	....	....	....	23
Preferred	100	....	....	....	....	....	....	28	....	....	....	28	27⅞	157
National Lead	100	51½	47⅛	51⅝	50⅜	51¾	50½	50¾	48¼	49⅞	48⅛	48⅞	47⅜	192,282
Preferred	100	109	107½	109½	109¼	109¾	108½	....	....	....	....	107	....	1,800
Phila. Nat. Gas	50	47⅛	46¾	46½	46¼	46¼	46	46¼	46	46⅛	46	46½	45⅞	9,842
Preferred	50	....	....	49	....	48¾	48½	....	....	48	....	48	....	307
Pittsburg Coal	100	16½	....	16½	16	16¼	16½	16¼	16¼	16½	16¼	16½	16⅛	3,283
Preferred	100	72⅜	70	71	69	73¼	69	73½	73	75	72	72	69	10,113
Republic I. & S.	100	24	23⅜	24	23½	23⅞	23½	23⅝	22½	23½	22	22⅜	21⅜	41,240
Preferred	100	83½	83	83⅞	83	83½	82	82⅝	80½	82½	80	80⅝	80½	17,200
Sloss: Shef. S. & I.	100	97½	96	97½	96	95	92½	92	91½	93⅛	92	92	....	4,300
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Standard Oil	100	628	627	630	627	630	....	635	631	....	....	....	....	130
Tenn. C. I. & R. R.	100	105	102½	104¾	102½	103½	100½	101½	98⅜	†100	98¼	99½	98½	72,700
U. S. Steel	100	37½	36⅜	38	37⅛	38¼	37⅜	37½	37⅛	37½	37	37½	36⅜	387,270
Preferred	100	99¾	98½	102⅜	100¼	103	101⅞	102	101½	102	101¼	101⅞	100¼	492,847
Va. Car Chem.	100	37	36½	37½	36¾	37	36½	35⅜	....	35½	35½	35½	35¼	7,230
Preferred	100	108	....	107¼	....	107½	107¼	107½	....	107⅞	....	....	....	110

†Ex-Dividend. Total sales 1,731,778.

Mexico.

March 31.

Company.	Shares Issued.	Prices, Mex. Bid.	Prices, Mex. Ask.	Company.	Shares Issued.	Prices, Mex. Bid.	Prices, Mex. Ask.
DURANGO:				San Rafael y An., aviada	1,200	$710	$730
Penoles	2,500	$2,600	$3,000	Soledad, aviada	670	1,200	1,225
San Andres de la Sierra	200	10,000	.....	Sorpresa, aviada	960	300	310
GUANAJUATO:				MEXICO·			
Cinco Senores y An., aviadoras	2,000	15	20	Aldebarren	2,000	20	22
Cinco, Senores y An., aviada	400	32	40	Buen Despacho	3,000	40	48
Providencia, San Juan de la Luz	6,000	154	159	Dos Estrellas	3,000	3,625	3,675
GUERRERO:				La Esperanza (El Oro)	3,000	1,500	1,500
Garduno y Anexas	7,200	31	35	Santa Ana, Esperanza	2,400	30	60
HIDALGO:				NUEVO LEON:			
Amistad y Concordia	9,600	74	75	La Fraternal	1,000	580	620
Carmen, aviada	1,100	160	175	Norias de Bajan	1,000	700	750
Guadalupe Fresnillo Mill	1,000	170	200	SAN LUIS POTOSI.			
Guadalupe Fresnillo Mine	1,400	70	80	Concepcion y An	3,000	20	30
Maravillas y An., aviador	1,680	70	100	El Barreno, aviadora	2,000	100	110
Maravillas el Lobo	1,000	130	180	Sta. Maria de la Paz	9,600	285	290
Refugia, aviada	12,800	5	7	ZACATECAS:			
Sta. Gertrudis y An., aviadas	9,600	7	10	Asturiana y An	2,500	8	12
Sta. Gertrudis y An., aviadora	28,800	72	73	Candelaria y Pinos	2,500	45	60
San Rafael y An., Trompillo	1,200	2,160	2,170	San Carlos y Annexas	2,500	15	20
				Sta. Maria de Gaud	2,500	81	84
				MISCELLANEOUS:			
				Bartolome de Medina	2,000	82	85
				Naica (Chihuahua)	100	11,000	13,000
				Natividad (Oaxaca) aviadora	1,800	600	720
				San Francisco Hac	6,000	65	75
				Union Hacienda	3,000	335	350

Paris.

March 16.

Company.	Location.	Par value.	Latest dividend.	Prices. Opening.	Prices. Closing.
		Fr.	Fr.	Fr.	Fr.
Acieries de Creusot	France	2,000	75.00	1,900.00	1,985.00
Anzin, Coal	France	....	290.00	5,810.00	5,750.00
Biache-St. Vaast	France	1,000	160.00	3,605.00	3,605.00
Boleo, c	Lower California	500	104.17	2,650.00	2,728.00
Bruay, Coal	France	400	27.50	745.00	745.00
Courrieres, Coal	France	500	110.00	2,961.00	2,940.00
Escombrera-Bleyberg, z.l.	France	350	35.00	720.00	722.00
Huanchaca, s	Bolivia	125	2.50	91.50	89.75
Laurium, z. l	Greece	500	25.00	333.00	325.50
Malfidano, z	Italy	500	50.00	640.00	650.00
Metaux, Cie. Fran. de	France	500	22.50	555.00	555.00
Mokta-el-Hadid. i. l	Algeria	500	40.00	1,030.00	1,035.00
Nickel, n	N. Caledonia	250	22.50	665.00	677.00
Penarroya, Coal	Spain	500	45.00	1,200.00	1,190.00
Vielle Montagne, z	Belgium	30	30.00	858.00	852.00

London.

March 31.

Company.	Par Val.	Latest dividend. Amt.	Latest dividend. Date.	Quotations. Buyers.	Quotations. Sellers.
American:	£ s.	s. d.		£ s. d.	£ s. d.
Alaska Treadwell	5 0	6 0	Feb., 1905	6 18 9	7 1 3
Anaconda	5 0	2 0	Nov., 1904	6 0 0	6 2 6
Camp Bird	1 0	9	Feb., 1905	1 12 6	1 13 9
Copiapo	2 0	5 0	Oct., 1904	1 8 9	1 11 3
De Lamar	1 0	2 0	Nov., 1904	16 3	18 9
El Oro	1 0	9	July, 1904	1 3 9	1 5 0
Frontino & Bolivia	1 0	rts.	Mar., 1904	18 0	19 0
Le Roi	5 0	5 0	Nov., 1899	13 9	16 3
Le Roi No. 2	5 0	2 0	Jan., 1905	16 3	18 9
Montana	1 0	6	Apr., 1899	1 0	1 6
Stratton's Indep'd	1 0	6	Feb., 1905	8 3	8 9
St. John del Rey	1 0	6	Dec., 1904	13 0	14 0
Tomboy	1 0	1 0	Dec., 1904	1 2 6	1 5 0
Tyee	1 0	2 0	Dec., 1904	1 10 0	1 12 6
Utah Con	1 0	6 0	Jan., 1905	8 10 0	8 15 0
Ymir	1 0	1 0	Mar., 1902	1 3	3 9
European:					
Libiola	5 0	1 6	May, 1904	1 13 9	1 16 3
Linares	3 0	5 0	Mar., 1905	4 5 0	4 15 0
Mason & Barry	1 0	7 0	May, 1904	2 15 0	3 0 0
Rio Tinto	5 0	37 6	Apr., 1905	65 10 0	65 15 0
Rio Tinto, pf	5 0	2 6	Apr., 1905	6 2 6	6 7 6
Tharsis	2 0	7 0	May, 1905	5 5 0	5 10 0
West Australian:					
Associated	1 0	2 6	July, 1904	1 16 3	1 17 6
Cosmopolitan	1 0	1 0	Apr., 1904	6 0	6 6
Golden Horseshoe	5 0	6 0	Nov., 1904	8 1 3	8 3 9
*Great Boulder	2	9	Apr., 1905	1 1 0	1 1 6
Gt. Boulder Perse	1 0	9	Mar., 1905	11 3	11 9
Great Fingall	1 0	7 6	Apr., 1905	8 0 0	8 2 6
Ivanhoe	5 0	9 0	Apr., 1905	8 0 0	8 2 6
Kalgurli	1 0	2 6	Apr., 1905	7 7 6	7 10 0
Lake View	1 0	1 6	Oct., 1904	16 3	17 6
*Oroya-Brownhill	1 0	4 0	Mar., 1905	3 7 7	3 8 9
Miscellaneous:					
Brilliant Central	1 0	6	Apr., 1905	12 6	17 6
*Brilliant & St. Geo	10	6	Mar., 1905	15 0	16 0
Briseis Tin	1 0	....	....	11 6	12 6
Broken Hill	8	1 6	Feb., 1905	2 1 9	2 2 11
Mt. Lyell	3 0	1 3	Dec., 1904	17 6	18 6
Mt. Morgan	1 0	3	Apr., 1905	2 11 3	2 13 0
Waihi	1 0	2 6	Mar., 1905	6 12 6	6 15 0
Indian:					
Champion Reef	10	1 3	Apr., 1905	1 13 9	1 15 0
Mysore	10	5 6	Mar., 1905	6 15 0	6 17 6
*Nundydroog	10	1 6	Mar., 1905	1 11 3	1 13 9
Ooregum	10	9	Apr., 1905	1 0 0	1 1 0
Ooregum, pf	10	9	Apr., 1905	1 7 6	1 10 0
South African:					
Angelo	1 0	5 0	Feb., 1905	6 12 6	6 15 0
Bonanza	1 0	7 0	Feb., 1905	18 9	1 1 3
British So. Africa	1 0	rts.	May, 1899	2 1 9	2 2 11
Cape Copper	2 0	5	Jan., 1905	4 2 6	4 5 0
Cape Copper, pf	2 0	6	Jan., 1905	3 17 6	4 2 6
City & Suburban	4 0	6 0	Feb. 1905	5 7 6	5 12 6
Consol. Gold-F'lds	1 0	2 6	Dec., 1904	8 2 6	8 3 9
Crown Reef	1 0	1 0	Apr., 1905	14 10 0	15 0 0
De Beers, preferred	2 10	10 0	Feb., 1905	18 1 3	18 3 9
De Beers, deferred	2 10	2 0	Feb., 1905	17 11 3	17 13 9
East Rand	1 0	4 0	Feb. 1905	8 13 9	8 16 3
Ferreira	1 0	2 0	May., 1905	20 0 0	21 0 0
Geldenhuis	1 0	5 0	Feb., 1905	4 18 9	5 1 3
Geduld	1 0	rts.	Mar., 1902	7 12 6	7 15 0
Henry Nourse	1 0	8 0	Feb., 1905	7 15 0	8 0 0
Heriot	1 0	5 0	Sept., 1899	3 17 6	4 2 6
Jubilee	1 0	5 0	May, 1905	3 7 6	3 12 6
Jumpers	1 0	2 6	May, 1904	1 17 6	2 2 6
Knights	1 0	....	....	6 0 0	6 2 6
Langlaagte	1 0	2 0	Feb., 1905	3 8 9	3 11 3
May	1 0	4 0	Feb., 1905	3 17 6	4 0 0
Meyer & Charlton	1 0	5 0	Feb., 1905	5 0 0	5 5 0
Modderfontein	1 0	rts.	Apr., 1902	10 17 6	11 0 0
Namaqua	2 0	3 0	Dec., 1904	3 13 9	3 16 3
New Goch	1 0	....	....	3 0 0	3 2 6
New Kleinfontein	1 0	rts.	Apr., 1902	2 6 3	2 8 9
New Primrose	1 0	3 0	Feb., 1905	3 1 3	3 3 9
Premier, def	2½	10 0	Apr., 1905	17 2 6	17 7 6
Premier, pf	5	....	....	9 8 9	9 11 3
Rand	5	5 0	Aug., 1904	11 2 6	11 3 9
Randfontein	1 0	rts.	Apr., 1899	2 18 1	3 0 7
Robinson	5 0	8 0	Feb., 1905	9 5 0	9 10 0
Robinson Deep	1 0	3 0	Aug., 1904	6 5 0	6 7 6
Rose Deep	1 0	3 0	Feb., 1905	8 2 6	8 7 6
Salisbury	1 0	2 0	May., 1905	1 10 0	1 15 0
Sheba (fully paid)	1 0	rts.	Feb., 1904	9 6	10 0
Simmer & Jack	1 0	5	May., 1905	2 2 6	2 5 0
Village Main Reef	1 0	4 0	Jan., 1905	6 2 6	6 7 6
Wemmer	1 0	12 6	Dec., 1904	7 15 0	8 5 0

*Ex-dividend.

Ishpeming, Mich.*

Week, April 8.

COMPANY.	Par Val.	High.	Low.	Last Sale.
Black Mountain ($2 paid)	$5	$2.00	$1.87½	$2.00
Black Mountain (Full paid)	5	....	....	....
Calumet & Arizona	10	106.00	105.00	105.00
Calumet & Pittsburg	10	39.00	35.00	35.00
Junction Dev. ($11 paid)	15	95.00	85.00	88.00
Lake Superior & Arizona	10	....	....	....
Lake Superior & Pittsburg	10	45.00	42.00	42.50
Pittsburg & Duluth ($8 paid)	15	24.50	23.00	23.00
Pittsburg & Duluth (Full paid)	15	26.50	25.00	25.00
Wolv. & Ariz. ($10.50 paid)	15	4.00	4.00	4.00

* By The Wallace H. Hopkins Co.

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others beside the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers

Metallic Iron in Nature.—In the book 'Secrets of the Rocks' there is a statement regarding the ore of Meadow Lake district, California, the implication of which is that gold occurs in metallic iron. Is this so?—H. C. R.

Answer.—The paragraphs to which you presumably refer read as follows: "Iron bright and unchanged" and "the solid, bright, unchanged iron," etc. These expressions refer to iron-sulphide ore carrying gold, for instance. On the surface such ore is usually highly oxidized and weathered, but with depth one approaches the fresh and "unchanged" iron pyrite which is frequently called "iron" for short. This does not in any way refer to metallic iron, which is a mineral entirely different from pyrite, and to which no reference was intended. It is merely a case of a common colloquialism, well understood in all mining regions, and not intended to deceive the reader who may be unfamiliar with mining dialect.

Fuller's-earth.—I have a large deposit of fuller's-earth in the West which could be developed advantageously if the demand is large enough to warrant the expenditure. What are the uses of this mineral, and how pure should it be to realize a good price? Who are the largest consumers?—J. B.

Answer.—This country already produces between 11,000 and 14,000 short tons annually, principally in Florida and New York, and imports from 2,000 to 3,000 tons, mostly from England. The domestic consumption is therefore about 15,000 tons per annum, chiefly for fulling wool and in deodorizing and clarifying fats, oils and greases. At New York quotations are 80c. per 100 lb. for lump, and 85c. for powdered mineral, delivered in bags. The Standard Oil Company, one of the largest users of fuller's-earth, obtains its supply mostly from its own mine in Florida, but refiners of lard, cottolene, etc., purchase in the open market. Among the latter consumers are the large packing houses, such as Swift & Company, Armour & Company, and G. H. Hammond Company, of Chicago, Ill. A good quality of fuller's-earth will analyze from 50 to 60% SiO_2, over 10% Al_2O_3, and less than 10% combined water.

According to recent calculation, ions are subject to a wave-shifting similar to the action of wave-drift on floating chips.

Recent Legal Decisions.

SPECIALLY REPORTED.

RIGHT TO SHIP OVER PRIVATE SWITCHES.—Owners of coal mines or other property adjacent to private switches will be interested in a case decided by the United States Circuit Court, in southern Indiana. This decision is to the effect that a party who has no property right in a private switch on land owned by another cannot compel the owner of the siding to permit a railroad company to receive and ship his freight over the switch. Furthermore, a railroad cannot be required to receive freight on a private siding. It is its legal duty to receive all freight offered to be loaded to its own stations or to regular shipping or receiving points.—Bedford Bowling-Green Stone Company *vs.* Oman.

MINERS' DEATH DUE TO VIOLATION OF LAW.—In the case of a recent explosion in the Princeton mine, in Indiana, in which seven men lost their lives and five others were injured, James Epperson, State mine inspector, has filed his report. Mr. Epperson finds that there was gross violation of the law by two persons—Harry Target, shot-firer, who was killed by the shot which he fired, and Roscoe Hedrick, who prepared the shot for firing, but who survived the explosion. Mr. Epperson finds that the shot prepared by Hedrick was in direct violation of the law, in that it was placed in a solid bank of coal having no 'loose end.' This 'loose end' is a technical mining term, indicating that, at one end of the bank or other, there must be space for the coal displaced by the shot. Where there is no 'loose end,' a shot fired in the solid bank cannot force the coal to either side, and must shoot backward out of the hole drilled for it, igniting gases or the coal dust in the mine. The fire, of course, consumes the oxygen of the air, and generates poisonous gases. The report recommends that Hedrick be held for trial for violating the law. The penalty is a fine of not less than $5, or more than $100, or imprisonment from 30 to 60 days in the county jail.

In the case of Jennings, the Indiana Appellate Court recently decided that a man, employed for the express purpose of going into dangerous places and making them safe, cannot recover damages from an employer if he is injured, because he has voluntarily encountered the dangers. In this case, Jennings was a 'jerryman' in the Ingall coal mine, near Evansville, and was employed to take down loose slate from the roof of a mine. He was injured by falling slate, after he had removed the props for the purpose of making it fall, and brought suit for $10,000 damages. The Appellate Court held, for the ground above stated, that he could not recover. This decision would apply directly in the case of the shot-firer who was killed in the Princeton case.

Abstracts of Official Reports.

Tennessee Copper Company.

The reduction process used by this company at its Polk county mines, in Tennessee, is undergoing transformation from heap roasting to pyrite smelting, and this disorganization has caused a diminution in the output for the calendar year 1904, as well as a temporary increase in the cost of production. When finished, the new plant will consist of seven furnaces, affording a capacity of 600,000 tons of ore a year. The furnace gases are to be utilized in making sulphuric acid, the plant for which, having an initial capacity of 400 tons of acid a day, is now being designed.

In order to clear up the accumulation of roasted ore in the heaps, mining was allowed to relapse to the actual daily needs of the new process, and yard roasting was definitely discontinued on April 1. Development, however, was pushed actively, and resulted in the enlargement of ore reserves by 650,000 tons. It comprised 433 ft. of shaft, raise and winze, 510 ft. of drift and crosscut, and 437 ft. of diamond drill holes.

The average number of men employed throughout the entire year, based on full working time, was 721, of whom 261 worked in the smelter and 162 in the mines. The company's railway handled 530,041 tons of ore, slag and matte, one-half the tonnage being in foreign cars. The Virginia Iron, Coal & Coke Company continued to mine iron ore, under its lease of the Eureka mine, and shipped 41,975 tons during the year.

The amount of ore raised from the three mines was 144,799 tons, three-fifths of which came from the Burra Burra mine, as compared with 287,465 tons, the total for the previous year. This was drawn mainly from old stopes and was distributed as follows: 63,784 tons to roast heaps prior to April 1; 57,559 tons raw ore direct to smelter; 23,456 tons stored as reserve of raw ore for smelter.

Two furnaces were in blast up to April 1, when the third was blown in and all three continued for the rest of the year. The charge smelted during the year was as follows:

Roasted ore, equivalent to 185,446 tons raw ore	166,901
Raw ore	54,870
Silicious ore	1,539
Custom ore	2,695
Converter slag	21,119
Blast furnace by-products	22,567
Blast furnace flue-dust briquettes	7,150
Quartz flux	32,972
Matte resmelted	5,350
Total	315,163
Coke used	34,053

This comparatively small tonnage, as compared with 284,202 tons of raw ore put through by two furnaces in the previous year, is accounted for by a slightly increasing refractoriness of the ore, by a preponderance of fine stuff coming from the clean-up of the roast yards, and by the fact that the capacity of a furnace is

less when running on raw ore than when on roasted ore.

The total charge, not including custom ore, was equivalent to 241,855 tons of raw ore. The copper was obtained from it as:

Fine copper in bessemer pig	6,018,525 lb.
Refined copper in ingots, etc.	2,170,372 "
Increase of material in process	428,800 "
Total copper recovered	8,617,697 lb.
Recovery per ton of ore	35.632 "

The recovery during the previous year was 37.615 lb. per ton of ore. Custom ores yielded 186,411 lb. copper.

On the basis of this production, the detailed expenses of putting copper on board trains at Copperhill, Tenn., may be stated thus in cost per ton of ore and per pound of copper:

	Per ton ore.	Per lb. copper.
Mines development	$0.2080	$0.0058
Mining, hoisting, etc.	.7718	.0217
Crushing and sorting	.0962	.0027
Railway	.2334	.0066
Roasting 77% of the ore at $0.4352 per ton.	.3337	.0094
Blast-furnace	1.2746	.0357
Engineering and laboratory	.0594	.0017
General	.1907	.0053
Converting	.2383	.0067
Total	$3.4061	$0.0956
Adjustment of ore account	.1357	.0038
Cost of fine copper in pig	$3.2704	$0.0918
Refining	.1461	.0041
Cost of ingot copper	$3.4165	$0.0959

The corresponding costs during the previous year were $3.0863 per ton of ore, and $0.0820 per lb. of refined copper, the increase in costs being due to the same causes that decreased the output.

The ore production, copper production, profit and loss and dividend accounts may be combined as follows:

Sales of copper, 8,443,979 lb., @ 12.76c. per lb.	$1,077,693
Rentals, etc.	4,003
Royalties, tolls, stores, etc.	55,471
Increase in copper stocks, at cost	26,549
Increase in deferred receipts	9,000
Total receipts	$1,172,716
Delivering ore at smelter	$228,899
Smelting and refining	432,281
Freight, commissions, office, etc.	108,865
Decrease in ore stock, at cost	135,675
Interest and discount	30,000
Depreciation	50,000
Total expenses	$985,720
Profit for the year	$186,996
Balance brought forward	498,150
Balance available for dividends	$685,146
Dividend No. 2, paid	218,750
Surplus	$466,396

Construction, at a total expenditure of $113,890, has comprised the following items: New Nordberg hoisting engine at the London mine; increased bin capacity at the Burra Burra and London mines, made possible by the avoidance of roasting; mechanical stokers, Murphy type, at the boiler house of the Burra Burra mine, enlargement of smelter power house, erection of third blowing engine and installation of mechanical stokers.

The enlargement of the smelter plant is well under way. Four new blast-furnaces, 56 by 270 in. in section, and a 300-ft. radial-brick stack are to be erected. The power plant is to have three more new blowing engines, an entire rearrangement of the boiler plant, with overhead coal bins, an increased electrical equipment and additional water supply. One new stand and five shells will be added to the converter department, with another electric crane and a clay mill for preparing linings. Machine and carpenter shops and a foundry have been built.

The company is capitalized at $5,000,000 and has an outstanding indebtedness of $450,000 in 5% mortgage bonds.

Atlantic Mining Company.

The mine of this Keweenaw Copper Company is situated near Houghton. The report covers the year 1904. "A" shaft, at the north end of the mine, has been definitely abandoned. Exploration on four levels was carried out to the property line, and a mill test, made on 17,300 tons of the product, showed only 11.01 lb. of mineral per ton, proving that this ore could be handled only at a loss. Sinking in two of the other shafts totaled 182 ft. at an average cost of $22.74 net; drifting extended 4,910 ft. at $7.86 per ft.; stoping amounted to 22,009 cubic fathoms at a mean cost of $4.42.

The year's milling operations may be summarized:

Rock stamped, tons	390,526
Product of mineral, lb.	7,149,640
Product refined copper, lb.	5,321,859
Yield refined copper per ton, lb.	13.63

The income and expense accounts in totals, and in cents per pound of refined copper, may be combined thus:

Sale of copper	$710,182	13.34c.
Rents, tolls, freights, etc.	32,341	0.61
Total receipts	$742,523	13.95c.
Underground expenses	$318,458	5.98c.
Surface expenses	89,056	1.67
Railroad operation	39,788	0.74
Milling expenses	118,312	2.23
Construction	5,229	0.10
Smelting, freight, etc.	65,766	1.24
Total expenses	$636,609	11.96c.
Profit for the year	$105,914	1.99c.
Balance brought forward	244,443	.....
Balance on hand	$350,357	.....

Of this balance, dividends to the amount of $50,000 were distributed among the holders of the company's $2,500,000 stock.

The main pumping plant was in use through the year, but it should soon be remodeled or replaced. Water skips have been provided for an emergency. Underground operations were suspended for two weeks in the summer, owing to a strike of the trammers. A change in the method of mining is being instituted, with a view to economy in timbering. The levels are now driven rapidly out to the boundaries of the property, and stoping is then begun at the outer ends and retreats towards the shaft. This permits a more complete extraction with less expense and increased safety. An unusual number of winzes have been put through during the year, for safety to miners and to assist ventilation.

The hoisting plant at "B" shaft was disabled late in the year, but is now being remodeled, while its output is being drawn temporarily from another shaft. The hoisting drum at "E" shaft has reached its capacity, and is to be replaced. The railroad has been re-graded and locomotives have been put into good repair. In the mill, repairs and replacements have been numerous. One stamp-head has been rebuilt and given a concrete foundation, and the round slime tables connected with it have been replaced by four Overstroms.

Coal Mining in Nova Scotia.

The report of Edwin Gilpin, Jr., chief inspector of mines for Nova Scotia, covering the year ending Sept. 30, 1904, states that the production of coal was 5,247,135 tons, an increase of 2,112 tons over the preceding year. The production by districts was as follows: Cumberland, 631,604; Pictou, 654,008; Cape Breton, 3,660,000; other districts, 301,523 tons.

The number of days worked varied in the different mines from 140 to 297, the average being 223 days for the year. The number of persons employed at the mines was 11,659 in all. The total number of persons killed and injured by accident was as follows:

	Number.	Per 1,000
Killed	27	2.32
Injured	80	6.90
Total casualties	107	9.22

The total number of days' work reported was 3,167,092. The number of casualties was, therefore: Killed, 0.009; injured, 0.025; total, 0.034 per 1,000 days' work.

The most serious accident during the year was the fire at the Joggins, in Cumberland county. The fire started on the main slope about 70 ft. above the 3,100-ft. level, and made it necessary to flood the entire section of the mine. The fire was extinguished, but it required considerably over a month to pump the water out, and it was necessary to clean out the slopes and levels, and to re-timber a considerable portion of the slope.

The total shipments of Nova Scotia coal reported were as follows: To New Brunswick, 414,537 tons; Newfoundland, 127,138; Prince Edward Island, 80,141; Quebec, 1,730,948; United States, 713,170; other countries, 83,082; total shipments, 4,544,609 tons. In addition to these shipments 80,811 tons were sold to colliery workmen and others at the mines, and 368,398 tons, or 7% of the total mined, were used in operating the collieries.

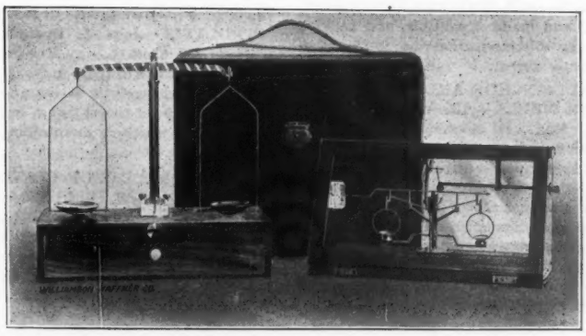
Mining machines of the Ingersoll-Sergeant type, operated by compressed air, have been in use at the Vale colliery, in Pictou county, and it is understood that others are to be introduced. At the Drummond colliery, also in Pictou county, coal-picking belts with patent conveyors are now being used with success.

The four largest operators in Nova Scotia are: Dominion Coal Company, 3,117,648 tons; Nova Scotia Steel & Coal Company, 492,604; Cumberland Railway & Coal Company, 489,687; Acadia Coal Company, 325,837 tons, mined in 1904.

A New Portable Balance.

The accompanying illustrations show a new portable button balance just placed on the market by William Ainsworth & Sons, balance manufacturers, of Denver, Colo. This balance is of the columnless type, which has come into much favor for field-work during the past few years, and is constructed to withstand a moderate amount of rough handling.

It has a 5-in. beam, agate edges and bearings, fall-away pan-rests, and is made with either single or double rider apparatus. An improved locking device locks the beam in position on the balance for carrying. The balance is operated from the left-hand end, and has concealed leveling screws of improved design. Two level vials are placed in the base, instead of a single circular level, as sometimes used.



PORTABLE BALANCE, WITH CASE.

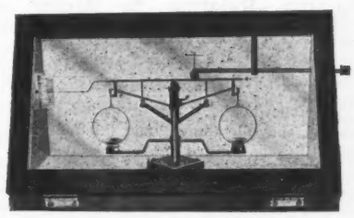
The case is of French polished mahogany, and a carrying-case of the same material is provided with a leather carrying-strap, lock and key.

A combination of the portable button balance with a portable pulp balance in a single carrying-case is the most compact and convenient prospecting outfit possible. All parts of the pulp balance pack in the drawer.

Centrifugal Pumps.

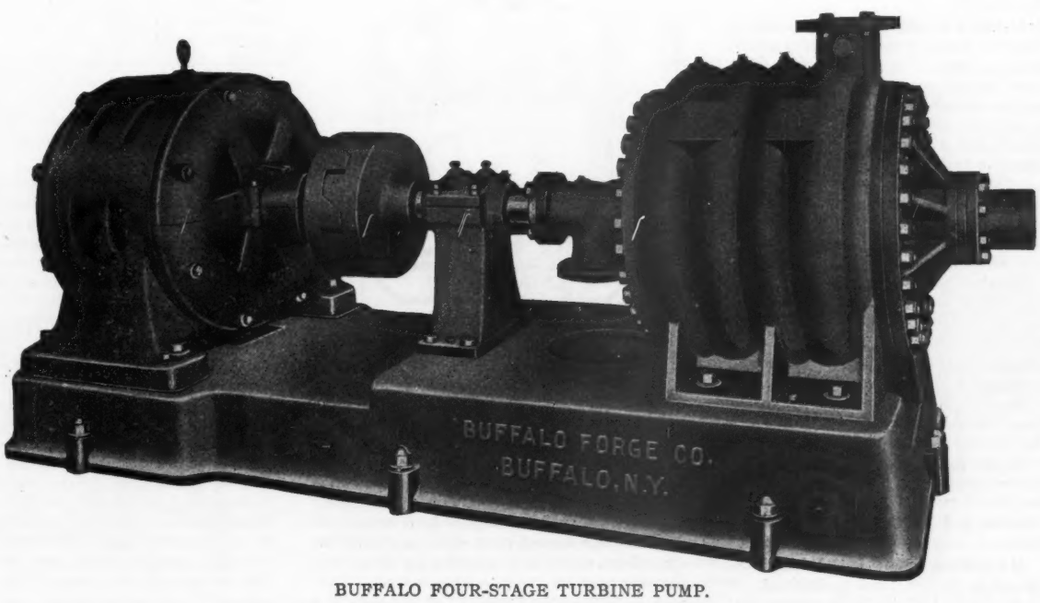
Few problems in the field of hydraulics present more interesting possibilities and at the same time have been so neglected as centrifugal pumping. The problem of the centrifugal pump designer is to proportion the parts of his pump so that it will pick up the water from rest, or from, perhaps, a velocity of 10 ft. per second, bring it to the high velocity required by the head pumped against, and then allow it to come to rest again in such manner that during the whole operation there shall be as little internal friction or loss by leakage and slippage as possible. Reports from the testing department of the Buffalo Forge Company show that the new design of pump shown herewith has been particularly successful in a combination of these results to produce a high efficiency machine.

Centrifugal pumps have a large useful field of operation, such as dredging, handling gravel and sand, drainage from deep mines and waterworks. The centrifugal pump that has created an entirely new field of application is what is generally known as the turbine pump. This style of centrifugal pump is especially adapted for mine drainage, waterworks, and all situations where good efficiency at high heads is required. One of the difficulties presented by high-lift centrifugal pumps has been the great peripheral speed required when only a single impeller is employed. This has been overcome by a few of the more advanced builders of this line of machinery, by mounting a number of disks or impellers, each operating in a separate chamber, upon a single shaft, and passing the water through the impeller chambers in succession. By this means the lift can be multiplied three, four and five times, while the number of revolutions is kept within such bounds that it is possible to connect the pump directly to a steam engine, or an electric motor.



PORTABLE ASSAY BALANCE.

The illustration shows a four-stage turbine pump built by the Buffalo Forge Company, of Buffalo, N. Y. A pump of this pattern, recently built for mining work in California, at 1,800 rev. per min. delivered 300 gal. per min. against a head of 800 ft., with an efficiency comparable with results obtained by reciprocating pumps.



BUFFALO FOUR-STAGE TURBINE PUMP.

As will be seen by the illustration, the simplicity of construction of this style of pump prevents liability to injury or disarrangement. These pumps are especially adapted for handling gritty or abrasive materials, and for pumping corrosive liquids. Economy of floor space, low first cost, and the absence of cost of repairs are all points in favor of the centrifugal pump.

Anodes made of fused plates of ferric oxide are said to be durable, even in the electrolysis of chlorides of the alkalies.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending March 28, 1905.

785,779. ART OF CONSTRUCTING CHIMNEYS OR STACKS.—George H. Thirsk, Philadelphia, Pa. A chimney or stack composed of angular brick, each brick slightly less in size than the preceding one, to form the corners of the chimney or stack and taper therein, rectangular brick to form the sides of the chimney or stack, and said angular brick and rectangular brick arranged in courses adapted to provide a true bond throughout the structure.

785,791. PROCESS OF MAKING LEAD DITHIONATE.—A. G. Betts, Troy, N. Y. A process of making lead dithionate which consists in decomposing a solution of manganese dithionate with lead peroxide.

785,819. MACHINE FOR SEPARATING GOLD FROM SAND, ETC.—Charles O. Michaelsen, Salt Lake City, Utah. The combination with a vertical shell, built of any suitable material, with a cap, and a concave bottom, of a rotatably movable and vertically adjustable worm-cylinder, provided with two concave-convex screw-blades, firmly attached on the outside of said cylinder and starting from opposite sides of said cylinder; said cylinder being provided with ingress-ports in its wall, and a funnel firmly attached to and forming the bottom of the worm-cylinder, to which funnel are firmly secured, at varying distances, agitating-arms, of suitable length, and bent to correspond with the concave bottom, of the shell, and curved in the direction of the motion of the screw-blades.

785,832. ELECTRODE FOR ELECTRIC FURNACES.—Edgar F. Price, George E. Cox, and James G. Marshall, Niagara Falls, N. Y., assignors to Union Carbide Company, Niagara Falls, N. Y. An electric furnace having an opening, an electrode having a holder in said opening, means for directly cooling said holder, and means for cooling that portion of the furnace adjacent to said opening and thereby indirectly cooling said holder.

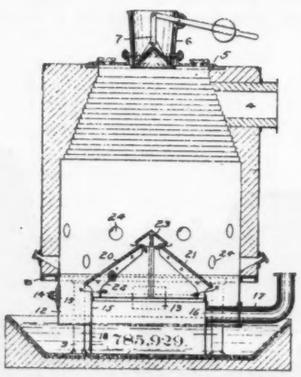
785,841. MATERIAL FOR FURNACE-LININGS.—Henry G. Turner, London, England. A process of heating magnesite in an electric furnace at the temperature of the electric arc to a point where the material crystallizes, cooling the resulting product, grinding the same, and mixing it with a suitable binding material which will harden and cause the mixture to set.

785,889. HYDRAULIC AIR-COMPRESSOR.—Clarence R. Jones, Pittsburg, Pa. In a hydraulic air-compressor, a main cylinder, a piston therein, a water-controlling-valve chamber having different diameters, a motor-valve having pistons of different size fitting in the valve-chamber, a primary valve located wholly within the movable motor-valve and at an angle to the axis of the motor-valve, and a stem arranged to actuate the primary valve.

785,906. CASING PACKER AND SHOE FOR GAS OR OIL WELLS.—Albert P. McBride, Independence, Kan. In combination, a tubular section having its lower end tapered and formed with an outer shoulder at the base of the taper, a band at the upper end of the tubular section having its lower end tapered, upper and lower rings loose upon the tubular section and having their inner or opposing ends outwardly flared, the upper ring having its inner side flared to conform to the tapered portion of the aforementioned band and made expansible, and packing loose upon the tubular section and confined between the rings thereof.

785,907. WALL-ANCHOR AND PACKER FOR GAS OR OIL WELLS.—Albert P. McBride, Independence, Kan. In combination, a tubular section having upper and lower outer extensions, rings loose upon said tubular section, the upper ring being expansible, a packing loose on the tubular section and confined between said rings, a tubular section connected with the lower loose ring and having an annular shoe at its lower end, and a packing at the lower end of the first-mentioned tubular section to make a tight joint with the said annular shoe.

785,929. GAS-PRODUCER.—Walter O. Amsler, Pittsburg, Pa., assignor to the Amsler Engineering Company, Pittsburg, Pa. In a gas-producer, the combination, with the combustion-chamber having a series of poke-holes in the clinker-zone, of a circular water-sealed trough below the combustion-chamber, a cylindrical apron extending downwardly from the combustion-chamber into the trough to a line below the water seal, having its inner surface in line with the line of the inner surface of the wall of the combustion-chamber, and provided with a series of openings located adjacent to the lower end of the wall of the com-



bustion-chamber, said openings of sufficient size to permit the removal of clinkers therethrough, a standpipe of large area having closed sides, its lower end resting on the bottom of the trough and extending upwardly to a line intermediate of the lower end of the wall of the combustion-chamber and the water seal, a fluid-supply pipe passing through the apron and in communication with an opening in the standpipe immediately above the water seal, a hood of large area above the standpipe formed of a series of non-perforated plates, means for supporting the hood above the upper end of the standpipe to form a fluid-passage between the upper end of the standpipe and hood, and a non-perforated hood above the first hood supported so as to form a fluid-passage between the hoods.

785,955. GAS-PRODUCER.—Francis W. Johnstone, Mexico, Mexico. In a gas-producer, the combination, substantially as set forth, of a vertical fire-chamber, an open-bottomed retort depending therein throughout the major portion of its height, means for supplying fuel to the retort, means for raising fuel which passes out of the bottom of the retort into the surrounding fire-chamber space between the walls of the producer and the retort, and a gas-discharge pipe leading out of the upper portion of the fire-chamber.

785,961. MANUFACTURE OF CARBON-TETRAFLUORIDE GAS.—John A. Lyons and Edward C. Broadwell, Chicago, Ill. A process of producing carbon-tetra-fluoride gas from the fluorides of the electro-positive metals, consisting in passing a current of electricity through a fused bath of the fluoride of such metal, in the presence of a cathode and an anode, and subjecting the fluorine gas liberated at the anode to the action of carbonaceous material immediately surrounding the anode.

785,962. PRODUCTION OF BORON BY ELECTROLYSIS.—John A. Lyons and Edward C. Broadwell, Chicago, Ill. The process of subjecting a fused bath of the borates of electro-positive metals to electrolytic action and subjecting the anion produced thereby to a reducing action at the anode which is maintaining at an intense heat.

786,009. PROCESS OF CASTING.—Frederick Cowden, Montreal, Canada, assignor of one-half to Robert Samuel Logan, Montreal, Canada. A process of casting metallic articles consisting in causing the molten metal being cast to come into contact with an unprotected loose heap of granular substance adapted to change the chemical and physical properties of the portion of the molten metal coming into contact therewith.

786,015. REINFORCEMENT FOR CONCRETE STRUCTURES.—Arthur N. Doud, North Stockholm, N. Y.—A reinforcement for concrete construction, comprising a tension-bar having retaining-arms formed on opposite sides thereof extending upward, and a compression-bar anchored at its ends in the tension-bar and having its central portion arched.

786,028. PROCESS OF MANUFACTURING BRICKS FROM REFUSE OF COAL OR COKE.—Johann Hammerschlag, Strassburg, and Hermann S. Gerdes, Jr., and Oscar Droste, Bremen, Germany. A process for manufacturing coal bricks, which consists in mixing coal or coke smalls with peat and solutions of alkalies or of ammonia, drying the mass if necessary, and pressing the same in a suitable manner.

786,023. PAINT.—George W. Gesner, New York, N. Y. A paint composed of a liquid vehicle with a drier, and an alloy of hydrogen and iron in a pulverized state, the hydrogen being in such proportion as to prevent oxidation or corrosion in said alloy.

786,032. SYSTEM FOR THE COMBUSTION OF GAS.—James A. Herrick, Philadelphia, Pa. In a system for burning gas, a gas-producer, means for introducing air and burning ungasified matter in the top of said producer, a furnace-chamber, a passage leading from said gas-producer to said furnace-chamber, a regenerator-chamber, and a passage leading from said regenerator-chamber to said furnace-chamber.

786,048. PROCESS OF PURIFYING PIG METALS.—John B. Nau, New York, N. Y. A process of purifying and enriching metals, which consists in pouring liquid metal upon a mass of broken pieces of solid oxidizing material in such manner that the liquid metal will be broken up and descend in small streams through the spaces between and in contact with the pieces of oxidizing material, causing a bath of the liquid metal to accumulate, maintaining immersion of the oxidizing material in the bath, so that the bath fills the spaces in the immersed mass of oxidizing material, for the period desired, and then separating the liquid purified metal from the oxidizing material.

786,051. PROCESS OF REDUCING ORES.—Dennis R. Robertson, Leadville, Colo. A process for reducing ore, which consists in subjecting the finely divided material in the presence of water to the action of a sodium salt and a potassium salts heating and agitating the mixture, adding salt, of iron and an acid and again agitating, allowing

the mixture to rest, and removing the separated values.

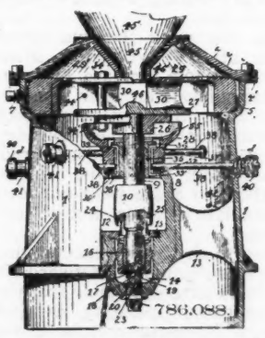
786,061. PROCESS OF REGULATING AIR AND STEAM SUPPLIED TO GAS-PRODUCERS.—Harry F. Smith, Lexington, Ohio. The art of supplying steam and heated air to suction gas-producers, which consists in causing the air and water to be heated to pass through an air-tube, interposing a vane in said tube to be acted upon and moved by the air as well as to control the water-supply by its movements, and heating the air and converting the water into steam and supplying the steam and air to the producer.

786,062. GRATE FOR GAS-PRODUCERS.—Harry F. Smith, Lexington, Ohio. A grate for gas-producers having a flat grated top, smooth imperforate sloping sides, and a horizontal ledge or rim at its bottom.

786,063. SUCTION GAS-PRODUCER.—Harry F. Smith, Lexington, Ohio. Means for supplying steam and heated air to suction gas-producers, consisting of a movable weighted water-holding vessel, provided with an orifice through which the water may be discharged; an air-pipe; a vane in the air-pipe, adapted to be moved by the action of the air thereon when passing into the pipe; connections between the vane and water-supply vessel, whereby by the movement of the former predetermined and constant supply of water may be discharged from the water-supply vessel into the air-pipe, and means for heating the air and water to convert the latter into steam, and means for conducting the air and steam to the producer.

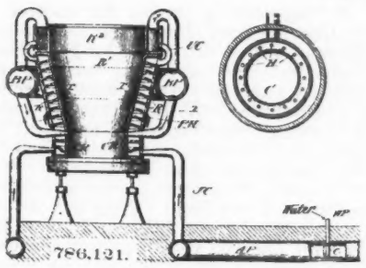
786,082. PROCESS OF COLORING NATURAL COMPACT CRYSTALLINE STONES.—Adolph Wultze, Charlottenburg, Germany, assignor to the Chemisch-Technische Fabrik, Dr. Alb. R. W. Braud & Co., G. M. B. H., Charlottenburg, Germany. A process for coloring natural crystalline compact stones which consists in freeing the stone from air, forcing by pressure a solution of a suitable compound into the stone, evaporating the solvent, again freeing the stone from air, forcing by pressure a solution of a compound able to give colored precipitates with the substance first introduced into the stone, and evaporating the solvent.

786,088. ORE-PULVERIZING APPARATUS.—Edward H. Benjamin, Oakland, Cal. The combination with the shell or casing, of a central guide-pillar within the shell or casing, an oil-well in the lower end of the said pillar, an adjustable plug working through the bottom of the pillar, a central drive-shaft working within the pillar, a universal ball-bearing joint between the lower end of the drive-shaft and the adjustable plug, a thimble fitted within the oil-well, a convex bearing-sleeve secured to the drive-shaft to work against the thimble, a spring-held bearing interposed between the upper portion of the drive-


786,088.

shaft and the central pillar, means for exerting lateral spring-pressure tension on the floating bearing, and devices carried by the drive-shaft for creating an upward air-draft through the said bearing during rotation of the said shaft.

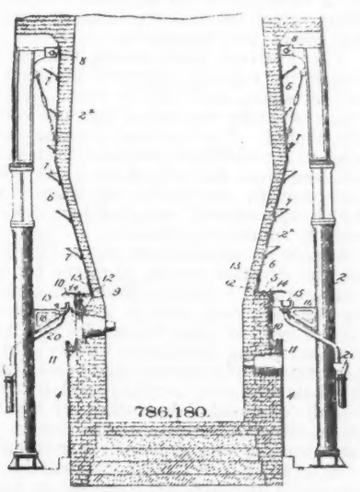
786,121. SMELTING-FURNACE.—Patrick Healey, Campbird, Colo., assignor of one-half to James D. Ireland and Avery Buckingham, Campbird, Colo. The combination, with a double-walled blast-furnace, of an air-pipe for introducing air between the walls, and a spraying device in the air-pipe located at a point outside of the point where the air-pipe enters the outer


786,121.

wall of the furnace for charging the air with an atomizing spray of water and cooling the inner wall thereby.

786,144. WOOD-DISTILLING PLANT.—Charles M. Palmer, New London, N. C. In a distilling plant, a retort; a series of cars for carrying material into said retort, each provided with a central perforated steam-pipe; means for connecting the steam-pipes on adjacent cars in the retort; an adjustable steam-pipe for introducing steam to said retort adapted to be connected with the steam-pipe of the outermost car in the retort, and a source of steam outside said retort with which the steam-pipe connects.

786,180. COOLING-JACKET FOR BLAST-FURNACES.—David Baker, Newton, Mass. In a blast-furnace and in combination with the bosh-wall, a cooling-jacket surrounding the same and provided at its lower end with a horizontal flat annular plate forming a continuation of the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outer surface of the jacket, and having its edge terminating beyond the body of the furnace, said plate adapted to receive without interruption the water flowing downward over the exterior of the jacket and adapted to permit it to be discharged freely outward, and a receiving-trough sustained free of the furnace-wall vertically beneath the discharge edge of the plate in position to receive the water flowing over said plate.

786,185. PROCESS OF PRODUCING METALS AND ALLOYS.—Henry S. Blackmore, Mount Vernon, N. Y. A process of reducing metal and producing alloys thereof which consists in fusing an oxy compound of a metal or metals having greater affinity for oxygen than the metal desired, adding thereto an oxy compound of the metal desired with another metal an alloy with which is sought, and subjecting the mass to the action of an electrolytic current capable of liberating the metals desired and replenishing the mass with more metal oxy compound from time to time as the bath is depleted thereof by reduction.

786,200. GAS-PRODUCER.—Alfred B. Duff, Pittsburg, Pa. In combination, a gas-producer, a water-sealed ash-trough therefor, an air-receiving casing in the ash-trough, substantially vertical gratings carried on the casing and distributed over a large area, a free space for the fall of ashes between the air-casing and producer walls, a louvered cone superimposed on the gratings, said cone consisting of a louvered ring of the casing, and a cover superimposed thereon so as to leave air-space in the wall of the cone, said air-spaces in the cone and grating being so proportioned that a sufficient quantity of air is made to act on the upper part of the fuel and light that part up to incandescence, while the lower grating causes the air to act upon such ignited fuel as it descends with a finer distribution and without raising the temperature at any point too high.

786,207. PICK.—William F. Gillooly, Coalton, W. Va., assignor of one-half to Patrick F. King, Monroe, W. Va. As an article of manufacture, a head for picks comprising a body portion having a socket therein for the reception of a handle and including laterally-extending arms, said arms having sockets in their ends and having recesses therein communicating with the sockets, points having stems engaged in the sockets and extending into the recesses, said steams having upwardly extending lugs at their free ends, latches removably disposed in the recesses and having notches therein in which the lugs are engaged to prevent disengagement of the points, said arms having depressions therein communicating with the recesses, springs disposed in the depressions and extending over the recesses and lying in engagement with the latches to hold the latter yieldably in engagement with the stems, and screws passed through the springs and engaged in the arms, said screws being adapted for operation to permit of lateral movement of the springs to disengage them from the latches.

786,221. PROCESS OF ELECTRO-DEPOSITING METALS.—Edward D. Kendall, Brooklyn, N. Y., assignor of one-third to Edward N. Dickerson, Stovall, N. C. The herein-described process of electrolytically depositing metallic zinc, which consists in the electrolysis of an aqueous solution containing zinc-sulphoglycerate by means of a suitable body acting as the cathode opposed to a suitable anode, both electrodes being electrically connected with the source of an electric current.

786,244. PROCESS OF EXTRACTING ALUMINUM OR OTHER METALS.—Henry S. Blackmore, Mount Vernon, N. Y. The process of reducing metal which consists in exposing a fused substance containing only one metal combined with one halogen, fluorine, and one or more non-metallic elements other than a halogen, to the action of an electric current of a voltage below that necessary to liberate fluorine therefrom, but capable of liberating one or more non-metallic elements.

786,248. CASTING.—Frederick Cowden, Montreal, Canada, assignor of one-half to Robert Samuel Logan, Montreal, Canada. A cast manganiferous steel article, a portion whereof contains a higher percentage of carbon than the remainder, such portion also containing a higher percentage of manganese than the remainder.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ending March 11, 1905.

9,384 of 1904. REFINING RARE METALS.—Electrodon-Gesellschaft, Berlin, Germany. Obtaining metals such as thorium and zirconium, quite free from oxide by first forming hydrides or nitrides.

23,601 of 1904. ORE FEEDER.—W. R. Smith, Buffalo, New York, U. S. A. Improved discharge from hoppers to traveling belts to insure regular feed of ore.

Special Correspondence.

San Francisco. April 4.

Some heavy deposits of gold-bearing sand have recently been found out in the center of the Sacramento valley in the tule lands of Sutter county. The sand varies in thickness from 10 to 20 ft., and lies from 7 to 15 ft. under the top soil. So far as examined, it is found in what appear to be regular channels of old river beds, and is much like the so-called 'black sands' of the ocean beaches of California. The sand was first found on the ranch of Mrs. Ida F. Lee, six miles west of Tudor station. A well borer subsequently sunk a well 35 ft. deep to get water for stock, and in the hole two separate strata of gold-bearing sand were found. Later, 30 holes were sunk on this ranch, and on that of W. T. Phipps, adjoining. One layer of sand is 15 ft. deep, and averages about 600 ft. in width. Many tests of the samples of sand were made with results running from $1.25 to as high as $40 per ton. There are no rocks or boulders, the sands being covered with alluvial soil. Within a few weeks other deposits have been found on the 7,000-acre ranch of John Markley, a few miles northwest of the other tracts, and quite a distance out into the *tule* basin.

It was never supposed that any gold would be found in these tule or marshy lands, so that no search has before this been made. Now, however, borings are being made at other places, and it looks as if much of the land would be available for dredging. Sutter has always been considered a purely agricultural county, its only connection with mining being membership and support of the Anti-Débris Association which is inimical to the mining industry.

The sale of the Bully Hill copper properties in Shasta county for a large sum is evidence of the fact that capital has not been frightened away from that county by the action of the United States courts in enjoining the Mountain Copper Co. for damage done by smelter fumes. The Mountain Copper smelters have a capacity of 1,000 tons per day; the Bully Hill, 300 tons, and the Afterthought, 200 tons. One other smelter is in process of construction, and still others are planned. It was at first thought that the injunction referred to would have a serious effect on the smelting industry in Shasta, but this seems not to have been the case. It is supposed, now that the Bully Hill has changed hands, a railroad will be built from De La Mar down the Pitt river to the Southern Pacific railroad at or near Kennett. There has been more or less of this proposed road for some years, or ever since the smelters were built. There is already a railroad from the mine to smelter, but none to the main line. The citizens are even now trying to raise money to make a good wagon road from De La Mar to Kennett, but a steam railroad would be much better for the entire mining section.

Heavy snowstorms have occurred in the foothills and mountains of the upper part of the State, at the close of last month, greatly to the delight of the miners. The snows have been rather light during the winter, and they have not packed sufficiently to insure very much water in the streams in the summer. In some places in the high Sierras from 2 to 5 ft. fell in the last few days of March. Every foot of snow in the higher ranges means more water for the rivers, and a longer continuation of the water supply for the miners in the coming summer. Not only the gravel miners but the quartz miners as well need this water, and a short supply means a close-down more or less early in the fall.

A long-pending contest for control of the Oroville Gold Dredging & Exploration Co. was settled this week by John Hays Hammond, and associates securing the majority interests. At the annual election J. E. Doolittle, J. W. Lilienthal and James H. Jennings were elected to represent the Hammond interests, and Mr. Doolittle was chosen president in place of Fred W. Bradley, the latter of whom had the backing of William Crocker of the Crocker-Woolworth bank. Bradley has been for the past year president and general manager of the company, but is now deposed. The directors elected are those in the interest of Hammond.

Denver. April 7.

The large mining companies are gradually adjusting their work to the 8-hour law, and by May 1, when a number of contracts expire, matters will be running satisfactorily everywhere.

In the southwestern part of the State a number of snowslides have caused a large amount of damage. At the Bankers' National mine, near Ouray, the bunk-house and boarding-house were carried away, carrying with them 11 men, four of whom lost their lives. Near Silverton the mill of the Iowa Mining Co., which was supposed to have been built at a point where a snowslide never ran before, was damaged to an extent of about $25,000. The tailing plant, which contained a large amount of machinery, was demolished.

The Portland Gold Mining Co. has declared its regular quarterly dividend of 6c. per share, and also an extra dividend of 4c., whereby the sum of $300,000 will be distributed. The amount for the latter was, it is understood, realized from funds received from the sale of the stock which the company owned in the Short Line, which was recently acquired by the Colorado & Southern railroad.

Leases on about 40 claims on Bull Hill, on the Stratton estate, property for two years, at a 25% royalty, have been granted by the executors, and in most cases the lessees will be required to do 300 ft. of sinking, giving bonds also for the faithful performance of the conditions of the leases, so that that rich territory will be thoroughly explored. A number of the late mine owner's friends secured leases. A large number of applications were filed.

At a point over 15,000 ft. from the entrance, in the Newhouse tunnel at Idaho Springs, the great Saratoga vein, the striking of which had been anxiously looked for for several weeks, has just been found, and at that point is over 7 ft. wide. This will give a great amount of stoping ground to the owners of the Saratoga property. Three feet of the width of the vein is heavily mineralized.

The State land board will make an effort to force the forfeiture of a lease to the Victor Fuel Co., which was granted on 1,280 acres of coal lands in Las Animas and Huerfano counties on account of the lessees not complying with the terms of the contract, by which the school fund of the State is suffering.

C. H. Moyer, president of the Western Federation of Miners, has filed a damage suit for $100,000 in the Circuit Court against former Governor Peabody, Sherman Bell and Bulkeley Wells, the former and the present adjutant general of this State, the latter having been appointed to the position by Governor McDonald a few days ago.

The plans of the permanent location of the El Paso & Durango railroad have been filed.

At a recent meeting and luncheon of the Denver Chamber of Commerce, J. H. Richards, of Idaho, the president of the American Mining Congress, was a guest a few days ago. He made a speech about the aims and the prospects of the organization which was very favorably received.

After the passing of the resolutions on the part of the board of trustees of the State School of Mines in regard to the plan for the establishment of secondary technical education at that institution, President Alderson sent a printed letter to the alumni containing these resolutions and inviting discussion on the subject, while he also invited the students to express their opinion. Although the comments of the mining papers have, as a rule, been in favor of the establishment of the proposed school, the expenses of which were never intended to be borne by the State, there seems to be a general opposition to the project on the part of the alumni and the undergraduates, and the probability is that the plan will be abandoned for the present. The most cordial feelings, however, continue to exist between the students and the faculty.

Houghton. April 8.

Labor troubles continue a disturbing element in the Lake Superior copper district. Operations at the North and South Kearsarge branches of the Osceola Consolidated Mining Co.'s property were suspended this week, owing to the strike of the miners and trammers, who demand a 10% increase in wages. About 1,000 men are idle as a result of the action of the miners and trammers. The discontinuance of work at these properties will reduce the production of the Osceola company, as they are the principal producers, furnishing fully three-fourths of the rock which is shipped to the stamp-mills.

Efforts to resume work in the Junior branch of the Franklin mine, where the trammers have been out on strike the last two weeks, proved unsuccessful this week. A number of miners and trammers who were not in sympathy with the strikers signified their willingness to proceed to work, and the sheriff and his deputies protected them. A party went underground in No. 2 shaft, but Superintendent Edwards decided not to try to keep the mine open, and No. 2 is again closed. The miners are asking a raise from $2.16 to $2.25 per day.

Early this week the underground employees of the Wolverine Mining Co. struck for a 10% increase, but returned to work within half an hour when informed by Assistant Superintendent Smith that their demands would be considered just as soon as Superintendent Fred Smith returned from California. Later in the week the men again went out, demanding an immediate increase, and did not return to work.

Owing to the highly encouraging showing in the openings eastward from 'B' shaft, it is entirely probable that the Michigan company, operating in Ontonagon county, will resume work in 'C' shaft during the early summer. Work at the latter point was discontinued a few years ago after a depth of 350 ft. had been attained. The suspension was due altogether to the doubtful title to the Rockland property, into which the shaft would pass at a depth of 400 ft. At the time of the organization of the Michigan company the Rockland property was acquired under titles which left open the possibility of a legal contest.

Since this was the case, the Michigan management wisely deferred the development of 'C' shaft, inasmuch as the opening of rich ground might have proved a strong incentive for some of the old owners of the Rockland property, or their heirs, to have attempted to assail the validity, not so much with a view to regaining ownership as to securing a monetary consideration. As the Michigan now has an absolute title to the property, all the capital stock of the Rockland corporation having been acquired, there is no reason why it should not undertake the development of the idle property.

An order has been placed with the Wisconsin Bridge & Iron Co., of Milwaukee, Wis., by the Massachusetts Consolidated Mining Co., of Ontonagon county, for the erection of a 22-ft. addition to the stamp-mill at Keweenaw bay. This extension will be built of steel and will be added to the concentrating department. It will contain additional jigs and tables made necessary by the increased capacity resulting from the compounding of the stamp heads.

During the last year and a half systematic efforts have been made to open the West lode in the Quincy mine, and much success has been obtained. The West lode parallels the Pewabic, or main amygdaloid bed, at an average distance of 100 ft., and recent openings in this bed insure the continuance of No. 4 shaft as an active factor in the mine's production for a number of years.

Scranton. April 10.

Notwithstanding the fact that a mine workers' committee has been in constant attendance at Harrisburg since the beginning of the session, to look after bills pertaining to their interest, only two measures have been acted upon—the increase of mine inspectors and the bill providing for the employment of children under 16 years of age in the mines. The child labor bill is not much in favor by the union mine workers, the western section of the State being against it. For that reason, it was only made applicable to the anthracite coal regions.

The last meeting of the committee on mines and mining in the legislature was held on April 6, when the labor committee of the miners appeared and pleaded for a favorable report on the 8-hour law bill, the miners' relief bill, and various other bills of a similar character. The committee received no satisfaction, and it was given out that these bills will not be acted upon by the committee, thereby giving the union mine workers nothing out of the many things that they asked for this session.

The principal agitators of the trouble among the coal miners at Earnest, Indiana, Pa., have been arrested and placed in the jail there. Three raids conducted by deputies resulted in the capture of seven of the leaders. The prisoners are charged with assault and participating in a riot at the mines. Nearly 100 additional men went to work at the Earnest mines on March 6. A statement issued by the Buffalo, Rochester & Pittsburg Co. intimates that practically all the men have returned to work. Deputies are still guarding the property and miners.

The Johnson colliery of the Scranton Coal Co. resumed work on Monday. The colliery has been closed for five weeks, during which time a new steel tower has been erected and the breaker remodeled. About 800 men and boys will be employed. It is expected that the output of the mines will reach 50,000 tons a month.

There was a large number of more or less serious accidents in the various mines up and down the anthracite region during the week. There was hardly a mine in operation that had not its tale of mishaps. It is extremely difficult if not impossible to discover the direct cause of the increase in the number of accidents. Mine superintendents and foremen say that it is not the fault of the companies. They declare that there is abundant timber at every shaft, and that the miners have only to ask for it to be supplied with as much of it as they want. The miners are certainly making no complaint on that score, nor are they bringing accusations of negligence or indifference against those over them. The fact seems to be that the greater activity in the mines, their operation at the lower levels, and the increased number of men engaged in cutting coal has considerably increased the risk to life and limb. Another reason, or probable explanation, is that the anthracite miners have not yet fully realized that the process of mining has been largely modified in many ways since the lower levels have been reached. The number of inspectors has now been increased to 20, so that practically every mine can be inspected at least once a week. The inspectors are certainly very assiduous in their periodical examination of the collieries.

The Gibbons Coal Co., of Scranton, which recently found a thick vein of coal under Winifred avenue, have decided to build a new breaker, near the drift, instead of running the coal to their old breaker, a mile distant. A hoisting engine has been installed, and coal will be hoisted at once. The breaker will be built near the old Connell breaker site, on Cedar avenue.

Duluth. April 8.

Ore is being loaded into docks at every iron-shipping port on the Great Lakes—first at Two Harbors and Duluth a week or 10 days ago, and at Marquette and Ashland this week. It has been loaded into ships at Duluth and Two Harbors, and these vessels are even now on their way to the East, the first of the tremendous flood of ore that is sure to come down this year. No additional ore charters are reported of late, but the tonnage now assured is well toward 25,000,000 tons, and there are surely 5,000,000 more to be placed later. The roads running from Mesabi and Vermillion points are taking the daily hoists, and those to Ashland and Marquette will soon be, while shovel operations will be started in a short time. Nothing has been shipped from the Michipicoten range yet, as the port is still difficult to reach, and for other reasons, but there is a considerable stock pile at the Helen, and shipments will begin very soon.

The organization of the Canadian Ore Dock Co. is reported; capital, $500,000. It is formed in connection with the Atikokan Iron Co., to erect a blast-furnace and ovens, etc., at Port Arthur, Ont., to utilize the mine of the Messrs. Hunter, of Duluth. Of the total issue of $1,000,000 bonds to be issued at once by this company it is understood that the Mackenzie, Mann & Co. interests—in other words, the Canadian Northern road—care for $400,000 worth; the Messrs. Hunter, of Duluth, $100,000; the town of Port Arthur, $200,000; and the iron company issues to pay for its ore properties $300,000 more, which are taken by the sellers of the mines. The town of Port Arthur has not yet completed its formalities for the issuance of its $200,000 in bonds, but is doing so as fast as possible. There is no doubt of the issuance. Work at the proposition begins as soon as these formalities are completed.

There will be an enormous amount of work done in the Mesabi mines this year by stripping companies. The Drake & Stratton Co. alone is to employ nine shovels and about 100 men to each, and will be stripping at the Stevenson, Fayal, Morris, Iroquois and other mines where it has contracts. Two or three shovels are at work, and the rest will be started in a week or so, as soon as the men have been employed and are ready. The company expects no trouble with men during the season; is paying $1.75 per day for common labor, and gets all it wants of that class.

Other stripping contractors, notably the Winston-Dear Co., will have a large force and employ many shovels in their operations.

Important work is planned for the Newport mine, Gogebic range, this season, and the mine is a far bigger and better property than at any time in its history. It is so large that its owners are said to have refused a sum far in excess of anything that had ever before been considered in connection with this mine, for a sale of the lease.

The Sellwood mines of the Mesabi range are preparing for a heavy season, and have sold as much ore as they care to deliver. One of the largest of these mines will probably be operated by another company this year, as a transfer of the property is about to take place. It will be heavily operated, too. Most of these mines are cheaply operated steam-shovel or milling properties, and have been selected with great care and skill for some special reason.

The Forest mine, belonging to the Tesora Mining Co., is operating and making a small daily shipment. It has made sales of ore that will keep it busy most of the year. Forest ore is a desirable bessemer, quite similar to the Stevenson, to which it lies quite near. Its ore goes out over the Great Northern road.

Salt Lake City. April 7.

Several stockholders in the Golden Star mine in the Gold Mountain district have applied to the courts for the appointment of a receiver and ask that the directors be required to make an accounting. The latter are charged with having held a secret meeting, and, without giving proper notice to shareholders, consummated a sale of the mine to the Annie Laurie Mining Co. for a consideration, it is claimed, of $450,000, whereas the property has a real value of $1,000,000. The directors of the company recently made application to the court for a dissolution of the corporation.

At the annual meeting of the May Day Mining Co., J. E. Darmer was elected president and general manager; I. M. Highly, vice-president; Henry Cohen, treasurer; John Campbell, secretary, who, with G. L. Korner, constitute the board of directors. All are residents of Salt Lake City. A little more than a month ago the company had an indebtedness of $5,000. Through favorable developments in the mine and a more favorable contract obtained from the smelters, this debt has been entirely wiped out and the treasury at the time of the meeting contained a balance of about $800.

The Fortuna mine of Bingham is in excellent physical condition. The development of the Keystone vein, recently encountered, continues, and, as far as developed, shows an average width of 6 ft. of good shipping ore with copper values of 7½%. The vein has been drifted on for about 60 ft., and explored by means of a raise for about 50 feet.

The work of opening the Ontario tunnel

at Park City, which has been closed for about 10 days on account of a cave, is being pushed ahead as rapidly as possible. The drift around the caved section has been completed to a distance of 17 ft. The extent of the caved ground has not been ascertained. The Ontario mine has filled up with water to the 1,400-ft. level.

The work of constructing the 'smoke-consuming' plant to be erected by the Utah Consolidated has been delayed somewhat by the non-arrival of some of the plans from New York. However, R. H. Channing, the manager, is carrying the work forward as far as possible under the conditions.

The zinc mill recently placed in commission at the Horn Silver mine in Beaver county, is gradually being brought up to the maximum. So far the plant has given very good satisfaction.

The March settlements for ore and bullion as reported by Salt Lake banks aggregated $2,144,100. Added to those not reported, this will bring the settlements for the month around $3,000,000.

Spokane. April 5.

The Rex Mining Co., a Finch & Campbell corporation, owning the Sixteen to One mine on Nine Mile creek, near Wallace, Ida., has started work, and expects to be employing 125 men within a month. The 250-ton mill will be worked to its capacity. Recent development has shown good galena ore.

The California Consolidated company, owning the Black Cloud mine and mill on Nine Mile creek, near the Sixteen to One, has sold its holdings to the Heinz Lead & Silver Co., of Pittsburg. The price is unofficially reported at about $100,000. The company, which includes about 20 stockholders, will be reorganized under the name of the Pittsburg Lead & Silver Mining Co. The mine has been operated lately by lessees. Last year it produced nearly 1,000,000 lb. of lead and 22,000 oz. of silver. Spokane electric power will be installed to operate the mill when the water supply gives out. The Pittsburg company also operates the Panhandle group near the California.

The Monarch mill at Murray, in the north belt of the Coeur d'Alenes, has commenced crushing ore and has shipped its first car of galena concentrate to the Everett smelter. About four tons of galena concentrate are being sent out daily.

The Ben Hur mine at Republic, Wash., has made its first shipment of gold ore to the Greenwood (B. C.) smelter.

There will be a lively fight for possession of the well-known Paragon mine near Northport, Wash. The Stevens County Exploration Co., backed by John R. Cook, of Spokane, will apply for patent, and the application will be fought by Kerr and Stone, of Northport, who recently jumped their claim. There are 20 tons of $300 ore sacked in the bins, which will go to the winner.

Spokane is fast taking rank as a mining machinery center that will rival Denver, Salt Lake and Los Angeles. Three years ago the iron industry here was almost nil. Now there are 275 skilled men employed in the foundries and machine shops here. An extensive trade is being built up with southern British Columbia. The Union Iron works has built five complete smelting furnaces, besides doing a great deal of repair work. It is employing about 125 men, mostly on mine and smelter supplies.

Pursuant to an injunction served on the Columbia mine managers at Sumpter, Ore., work under its contract with the Tabor fraction has been suspended until an accounting is had. The Tabor fraction alleges that $50,000 worth of ore has been misappropriated by the Columbia.

The Killen, Warner, Stewart Co., of Sumpter, is promoting a railway from Sumpter to Bourne, Ore., to cost $200,000. The road will connect various mining camps with the Sumpter smelter.

D. M. Hyman, of New York, who had an option in escrow on the Bernier and the Flynn group, near the Frisco at Gem, Idaho, in the Coeur d'Alenes, has dropped the deal. He wanted a readjustment of terms which the others would not meet.

R. L. Boyle, promoter of the Keller & Indiana Consolidated Smelting Co., which is putting in a smelter at Keller, Wash., on the south half of the Colville reservation, announces that 21 tons of machinery, including water wheels and electric supplies, have been shipped from Cincinnati and Chicago. The dam across the San Poil river is completed and the flume, 5 by 4 ft. in size, is half done. He expects to commence construction for the buildings the latter part of the month. Fifty-three men are employed.

Butte. April 5.

A shoot of gold ore that assays from $500 to $1,000 per ton has been struck in the Nancy Hanks mine in the Garnet district, about 70 miles northwest of Butte. The property is owned by Samuel I. Ritchey, but is under lease to Al Lowry. The shoot is 70 ft. high and 50 ft. long, and is estimated to contain 2,000 tons of ore. It varies in width from 10 to 18 in. The mine has yielded about $400,000 in gold.

The Pittsburg & Montana Co. is having trouble with its new pumps and has been compelled to summon an expert from the East to remedy the defects. He is now at work on them. In order to keep the water from the workings of its mines while the repairs are in progress, the company is operating from 9 to 12 other pumps and 4 tanks almost night and day. United Copper has adopted a portion of the Baggaley process for treating its copper-silver ores, and is now using it in its Butte smelter.

The Montana-Revenue Co., operating near Virginia City, has resumed the treatment of ore in its mill. February 13 the water in the mill froze and work was suspended.

The Watseca company, operating at Rochester, 40 miles south of Butte, started its large mill yesterday on tailing, which carries a value of about $3 in gold per ton. It is estimated that there is about 100,000 tons to be treated.

The Colorado Mining Co., an asset of the Amalgamated, has been succeeded by the Trenton Mining & Development Co. on account of the expiration of the charter of the former. The Colorado was organized under the laws of Colorado 25 years ago, and mined and smelted ore in Butte up to last November. The property has been transferred to the new company, which is organized under the laws of New Jersey. The deed was executed by W. G. Rockefeller, John E. Judson, Paul H. Webster, Frederick P. Addicks, Henry H. Rogers, Percy A. Rockefeller and Albert H. Melin. The property comprises about 35 quartz and placer claims, a concentrator and smelter, together with water and mill-sites and real estate. The Gagnon, one of the claims, is a large producer of copper-silver ore, and is right in the heart of Butte.

The Emma mine, in Butte, on which the Butte Mining & Development Co. spent about $200,000 in an effort to make a copper property out of it, has been transferred to the Butte Copper & Zinc Co., organized under the laws of New York. The consideration is placed at $1, but a mortgage executed in favor of Charles E. Dickerman, the owner, calls for the payment of $55,000 in cash. The Emma is a zinc-silver mine, and the company intends to treat the ore by the new electrical process in use by the Montana Zinc Co. in the mill of the Alice company. It was formerly under lease and bond for $125,000, but this amount was subsequently reduced to $110,000.

The United Copper Co. is building a new reverberatory furnace in its smelter. It has four blast furnaces, but only one is in operation. Local officers of the company say that from 1,200 to 1,500 tons of ore are being treated in the plant per day.

Deadwood. April 7.

The hoisting plant of the Clara Belle company, near Custer, was recently destroyed by fire, but as only a portion of the machinery was ruined, the loss can be quickly and easily repaired. The origin of the fire was a mystery, but is supposed to have originated from a burning candle dropping from the stick. The company was engaged at the time of the accident in taking out a test shipment of ore which was to be consigned to Denver ore testing works in order to determine the proper process for handling the mine product. The shipment of this lot will be necessarily delayed.

The Mainstay company, of Keystone, S. D., T. R. Griffith, general manager, is working a large force of men in preparing for mill operations. Ten stamps are being added to the plant where they had been removed some time ago and sold to the Extreme company, at Custer. Wilfley slimers and a cyanide department for handling the concentrates are among the other improvements. A drift is being run from the bottom of the Ida Florence shaft to connect with the Bismarck workings. Both of these claims belong to the Mainstay company.

The Gilt-Edge Maid mill in the Galena district was put in commission on the first of the month after a shut down of a little over a month. During the suspension several changes were made in the arrangement of the mill, and it is believed that the plant is now in shape to do better work than ever before. A Hendrie & Bolthoff electric hoist, the first one in the Black Hills, has been installed in the upper tunnel level to raise ore from the lower tunnel workings. C. A. Brown is mill superintendent.

It is stated, on what is believed to be reliable authority, that the Columbus Consolidated will soon proceed with the construction of its mill, near Central City. Word has been received in this city from Messrs. Sauntry and Mayham, the principal owners in the company, that work will begin at an early date.

The National smelter of the Horseshoe Mining Co., at Rapid City, has been leased to C. D. Crouch, general manager of the M. R. & N. W. railway. He proposes to have the plant in running order by the time the railroad is completed to furnish transportation to the ores of upper Rapid creek—Silver City, Pactola, etc.

The big working tunnel of the Lexington Hill Gold Mining Co. has been connected with the Champion shaft at a distance of 1,650 ft. from the entrance. The bottom of the shaft—275 ft. below the surface—was 8 ft. above the roof of the tunnel. N. C. Bonnevie, of Denver, Colo., is consulting engineer for the company,

and the tunnel was driven at his recommendation and under his supervision.

D. C. Baker and Richard Tamblyn, who secured a bond on the Finlander property, near Roubaix, a short time since, are reported to have completed negotiations with Eastern parties for sufficient money to equip and develop the property. There is a fine showing of good free-milling ore on this ground, but not a great deal of development has been done.

Bisbee. April 7.

The north drift on Lake Superior on the 1,000-ft. level, which has been run to make connection with the original workings of the Calumet & Arizona, has passed out of Lake Superior company's ground and is in the southerly claim, the Buckeye, and is but a few hundred feet from connection with Oliver shaft. As soon as this connection is made there will be a direct opening from the Irish Mag shaft, out of which all ore from the group has so far been hoisted, to the No. 3 Lake Superior, a distance of about 8,000 ft. Connections have been made from the Irish Mag to the workings of the Copper Queen, and one will be able to walk in nearly a due south course, from underneath the Copper Queen hotel, in Bisbee, to the No. 3 Lake Superior shaft, a course of 2.5 miles. In running this drift on Lake Superior, numerous stringers and ore indications were met, that will be followed later. The work of the time was to cut the drift through and no side work was done along the way.

Within a few weeks the Oliver shaft of Calumet will be in readiness for hoisting on a large scale, and will begin production. Now no ore is coming from that end of the property except a small lot of sulphide needed in the furnace mixture. It is expected that as soon as this shaft gets into commission No. 3 furnace will start up for a steady run, and the camp's production will be increased by another 40 tons daily.

Saginaw Development shaft is down 810 ft., and is going on at the rate or 2 ft. daily. It is still in very nice looking formation. On the 350-ft. level a drift has been working through leached lime for some time, and the idea now is that it is too high, for the rock is thoroughly cleaned of its copper content. A second drift will be started near the present bottom of the shaft.

Houghton has been working in better ground for some time, and recent reports from there are that it has cut copper, but these are not confirmed yet. The management is very much encouraged with the prospect and work will be pushed somewhat more energetically. So far Houghton is getting on slowly. The company is a close corporation, and has sold no stock from the first, and very little then. There has not been enough of this stock out for months to make a quotation.

The slime from Charleston, the last of the old tailing from Tombstone mills, will be shipped to El Paso smelter in a few days. The slime is to be used for furnace mixture and carries much silver and some gold. The other beds of tailing, which have been worked over two or three times by Chinamen, are also to be shipped, to Douglas, for the manufacture of cement blocks. Slags from the old smelts are also to be shipped away, some for smelter flux and the rest for bricks.

The hoisting of ore from Cole and Congdon shafts of the Calumet group begins in a few days, and No. 4 smelter of the group, at Douglas, will blow in for caring for this ore. The production of the camp will be increased about 40 tons of blister copper daily by this addition. Both the Lake Superior and the Duluth mines, on which these two shafts are, have been ready to mine for some time, but proper shafts for hoisting have not been completed. Now the Cole shaft is a great bore 5 by 17 ft. in the clear, and fitted with four compartmens. It will take ore from both mines until the completion of the Congdon shaft, a three compartment which is nearly down to connection.

Dawson. March 24.

The chairman of one of the leading banking institutions of Canada recently made the following comment: "In the Yukon the output of gold showed further diminution, barely reaching $10,000,000 in 1904, as compared with $11,000,000 in the preceding year. The population of Dawson is also considerably less than it was a year ago; but this is by no means surprising, for in placer-mining camps, as the auriferous ground is worked out the miners move on to more attractive fields of labor; and so it has been in this case—the exodus to the goldfields of Tanana and Fairbanks having been on a large scale. Apart from fresh discoveries that may be made, either of placer or quartz, the future of the camp appears to depend chiefly upon an adequate water supply, and efforts are being made toward the attainment of this object. Whatever may be the output in the future, it is interesting to look back at the results of the camp, since it first came prominently into notice seven years ago, for during this period the value of gold recovered has certainly been not less than $100,000,000. These figures must surely entitle it to rank amongst the wealthiest placer-mining camps in the world."

News has been received of a stampede for the scene of some new discoveries on several streams about 100 miles up the Tanana river from Fairbanks. On Tenderfoot creek coarse gold averaging 11c. to the pan is reported to have been struck at a depth of 3 ft. At Little Delta it averages 10c., and along Gerstle river 8c. a pan. The showings generally are stated to be better than at Fairbanks, and the whole country is being staked for miles.

Two nuggets of gold recently found in the vicinity of Hunker creek have been attracting attention. The larger one, weighing 26 oz. 5 dwt., was found in Mint gulch, a tributary of Hunker creek. The gold is entirely free from quartz, and is of an estimated value of $16.20 per oz. The second nugget came from the property of the Klondike Consols; it weighs exactly 7 oz. and is of similar quality to the larger nugget.

A miner in from Stewart river brings the information that there are 25 men working on Henderson creek and 20 on Thistle creek. Some of the workers on Henderson have rich pay, and all on both creeks have good dumps that promise to clean up well. A number of men have started for Big Gold, a tributary of Sixty-mile. Many from Miller and Glacier creeks have staked ground. Other tributaries of Sixty-mile river, believed to be equally as rich as Big Gold, will be prospected next summer, that being regarded as the coming section of the Yukon Territory for rich diggings.

All the stages coming in from Whitehorse are bringing passengers, most of them being men who have been outside for the winter and are now returning for the season's work on their claims. Owing to the breaking up of the ice and the bad state of the roads for staging, fares are to be raised $25 or $50 from April 1. When the traveling shall be good again rates will probably be reduced.

The promoter of the railway from Chena to Fairbanks and the creeks has left Dawson for the Tanana. The company that will build the line has 180 tons of rails at Dawson and 800 tons more at the mouth of the Hootalinqua, the latter having been started from Whitehorse too late last season to reach Dawson before navigation closed.

Toronto. April 7.

The Ontario Bureau of Mines has issued a report dealing with the mineral production of 1904 which shows a net metallic production of $5,071,677 and non-metallic products valued at $6,665,970, making a total of $11,737,647. This is a decrease as compared with 1903, the figures for which were: Net metallic production, $5,242,575; non-metallic production, $7,628,018; total, $12,870,593. The decrease in the output of metals is due to the falling off in the yield of gold, nickel and copper. Gold was produced to the extent of 2,285 oz., value $40,000, the output of the previous year being 10,383 oz., value $188,036. The yield of nickel was 4,743 tons, value $1,516,747, as against 6,998 tons, value $2,499,068 in 1903, while the production of copper has fallen from 5,331 tons, value $716,726, to 2,163 tons, value $297,126. Silver shows a marked increase, due to the discovery of the silver-cobalt mines of Timiskaming district. The output, which in 1903 was only 16,688 oz., valued at $8,949, has risen to 206,875 oz. of the value of $111,887. While the yield of iron ore has decreased from 208,154 tons, valued at $450,099, to 128,253 tons, value $273,068, the output of manufactured iron and steel shows a notable increase. The production of pig iron was 127,845 tons, value $1,811,664, as against 87,004 tons, value $1,491,696 the previous year, and steel was produced to the extent of 51,002 tons, valued at $1,188,349, as compared with 15,229 tons of the value of $304,580 in 1903. Cobalt figures on the list for the first time with an output of 29 tons, value $36,620, and two other additions are platinum, 536 oz., value $10,452, and palladium, 952 oz., value $18,564. Other items are, lead ore, 3,210 tons, $11,000; zinc ore, 533 tons, $3,700, and pig lead, 43 tons $2,500. The total number of men employed in connection with metallic production was 2,807, and the wages paid $1,334,767.

The general revision of the mining laws of the province of Ontario promised by the new administration has been postponed until next session of the legislature. In the meantime a new mining district will be created in the district of Nipissing, which will place settlers and mining men in a better position as regards recording discoveries and locating claims.

A valuable mining claim, J. B. No. 6, in the Haileybury district south of W. G. Tretheway's noted cobalt-silver mine, is in dispute between Tretheway and the Nipissing Mining Co. The question will be disposed of by the Provincial Crown Lands Department, and the case has been adjourned until April 14 to allow of the production of evidence as to priority of discovery.

It is understood at Ottawa that the mining regulations of the Yukon will be considerably modified this session of parliament. The bill to be brought in by the government will increase the size of placer mining claims from 250 to 500 ft., and discovery claims will be enlarged from 500 to 1,000 ft. The royalty on copper and gold from quartz will be remitted for 10

years, and free miners' licenses will be reduced from $7.50 to $5. A survey of the Indian and Klondike rivers will be undertaken in order to solve the problem of obtaining water for mining purposes.

The output of the Dominion Coal Co.'s mines at Glace Bay, N. S., for March was as follows: Dominion No. 1, 33,277 tons; Dominion No. 2, 65,850 tons; Dominion No. 3, 21,748 tons; Caledonia, 45,081 tons; Reserve, 46,552 tons; Hub, 8,565 tons; International, 7,692 tons; total, 228,765, or about 100,000 tons in excess of the February output.

Victoria, B. C. April 4.

The Minister of Finance for British Columbia has submitted to the Provincial legislature his estimates of revenue and expenditure for the ensuing financial year. In the course of his budget speech he made brief reference to the mineral production of the province for the year 1904, as follows: "The increase in mineral production for the past year was very gratifying. In the year 1903 the total production was under $17,500,000, while for 1904 the lowest estimate was nearly $20,000,000, and some reliable authorities placed it about $21,000,000. This increase in value also pointed to largely increased output, as the value of copper in 1904 averaged ½c. per pound less than in 1903, and that of lead was very slightly higher. The principal increases were in lead, which doubled the output of 1903, and in coke. The estimated value of lead and copper in 1904, and the revised figures for 1903, are as follows:

	Lead.		Copper.	
Year.	Quantity. Lb.	Value. Lb.	Quantity. Lb.	Value.
1903	18,089,283	$689,744	34,359,921	$4,547,535
1904	37,000,000	1,500,000	36,688,500	4,600,000

In regard to the taxation of mines, the Finance Minister hoped that in any future amendment of the present system the principle of rebated taxation would be made to apply to ores smelted in the province.

In connection with a proposed amendment to the Coal Mines Regulation act, now before the local legislature, having for its object the making of an 8-hour day "from bank to bank" compulsory, T. R. Stockett, Jr., general manager of the Western Fuel Co.'s colliery, at Nanaimo, Vancouver Island, is reported in the local press to have stated, in the course of an interview, that the effect of this amendment, if it be passed, will be to deprive his company of all the advantage it has gained by recent additions to equipment of modern appliances and by economies in operating. The competition of fuel oil in California, which is the chief market for Vancouver Island coal, is so keen that the increase of cost the adoption of the proposed change would involve would place the coal mines at a serious disadvantage. The Western Fuel Co. can successfully compete for Californian business under existing working conditions in this respect, namely, eight hours from bottom of shaft to bottom of shaft, but not from surface to surface. It has been plainly intimated that if the amendment becomes law some of the Island coal mines will be closed and will remain idle until that provision shall have been repealed.

The Canadian Pacific Railway Co. has been experimenting with anthracite coal from its own Bankhead colliery, at Banff, in the Rocky Mountains, in locomotives running on its transcontinental line eastward from the boundary between British Columbia and Alberta. So far results have been satisfactory, but if it be decided to use this coal it will first be necessary to equip the engines with suitable fire-boxes built for hard coal, instead of the ordinary steam coal now used, which is obtained chiefly from the Crow's Nest coal fields.

Monterey. April 4.

Following the new monetary and coinage law, there was made public last week the new law affecting mining taxes, which, like the coinage law, is to go into effect on May 1 next, and is in substance as follows: The 2% coinage tax on gold and silver is abolished; the assaying, melting, refining and parting dues are collected only when the operation is, or need be, actually performed; the internal stamp tax shall be 3½% on all gold and silver in ores, slags, cyanides and percipitates not refined in the Republic, and 2½% when refined in the Republic of Mexico, and metallurgical establishments refining to .999 fine shall have a rebate from this 2½%, the amount of which rebate to be determined later; in imposing the taxes 75 centigrams of gold shall be figured as $1.00 Mexican, and the price of silver shall be announced each month and shall be determined by the average rate of exchange in New York for the preceding month; there shall be no internal stamp tax on refined gold presented to the mint for coinage or in exchange for silver coin, on gold and silver coins of current foreign or national issue, on silver in ores, slags, cyanides, etc., if contents do not exceed 250 grams (8.5 oz.) per ton, on gold and silver imported in ores or other form of treatment in Mexico if exported inside of four months, nor on gold and silver employed in national industries; the maximum State tax on mines is limited to 1½% instead of 2%; metallurgical establishments having concessions will not benefit from this law unless they reject their concessions, and the concessions now in force will not be renewed when they will have expired; the stamps on title deeds to mining claims shall be $5.00 Mexican per partinencia (of 2.4 acres), instead of $10.00; the annual tax is also reduced from $10.00 to $6.00 per pertinencia, but when held in groups of over 25 claims or pertinencias, it shall be but $3.00 per year for those in excess of 25; no application for mining claims unless a deposit of $6.00 per pertinencia is made in the land office; import duties shall cease on zinc (in pig or filings), sulphur, alkaline cyanides, hyposulphites, sodium and potassium nitrates, and sheet zinc of under 1 by 2½ meters by 1 millimeter in thickness and perforated every 20 centimeters, and also on sulphuric acid and copper sulphate until June 30, 1908; machinery for mining and metallurgical establishments shall come in free of duties until June 30, 1908, if the government is advised of intended shipment with proper invoices, drawing of the machinery, etc., and if the shipment does not require more than two months in crossing the border, and if said machinery is set up within six months after the last shipment crosses the border.

In the State of Mexico the Mexican Venture Syndicate, which was organized about 7 years ago with a capital of £50,000, which proved too small, and necessitated its running into debt for development work continuously since, has turned over its holdings or merged into the Mexican Mines of El Oro, Ltd., which has been organized, with a capital of £180,000. The Dos Estrellas company, at the annual meeting, held March 23, reported a gross product of $3,577,526 Mexican, of which there was a net profit of $2,123,881; that $39,000 gold had been paid to the McArthur Forrest Syndicate for all future use of the cyanide process; and that after Oct. 1 next the entire power would be electricity from the Mexico Light & Power Co., with which a contract had been made for ten years for 2,500 h. p., at $50 gold per h. p. per year. Near Sultepec, Messrs. Fournier and Prieto, large stockholders in the Dos Estrellas, are preparing to start the San Juan Baptista, a supposedly rich, old, abandoned property.

London. April 1.

The Rio Tinto Co. reports that during the year 1904 the gross profit from the sale of produce amounted to £1,667,530. After allowing for expenses of administration, taxes, debenture interest, depreciation, etc., the net divisible profit was £1,242,252. Out of this £77,000 goes to preference shareholders, and £1,170,000 as ordinary dividend, being at the rate of 70%. Nothing is placed to reserve fund this year, but as this fund now stands at half a million pounds, and as the heaps of ore are sufficient for five years' supply at the present rate, it is hardly necessary to further augment it. The produce of pyrites during the year was 1,948,819 tons, of which 1,276,475 tons were treated locally for copper, and 672,344 tons were sold to chemical manufacturers in England, Germany and America. It is interesting to note that 144,484 tons went to America. The average copper contents of all the ore was 2.34%. In addition to this copper-bearing ore, 157,810 tons of barren ore was sold to its sulphur contents alone. The production of copper during the year was 21,218 tons locally, and the ore shipped to chemical manufacturers contained 12,260 tons of copper. The company is starting to make superphosphates on the spot, and is now erecting a sulphuric acid plant in which they will employ their barren ores. During the year Mr. Keswick, the chairman of the company, died, and he has been succeeded by C. W. Fielding, who for some years has been the active head of the company's business. It is not too much to say that the company's present excellent position is largely due to the combination of business ability and technical knowledge possessed by Mr. Fielding. Your readers in America will know him also as the leading spirit in the Mountain Copper Co., in California. As I mentioned last week, the shares in this company are a remarkably sound investment, and stand in a class by themselves among mining shares. The debentures and preference shares are as safe as anything can be in this world, and the opinion of the market as to the value of the ordinary shares is reflected by the fact that they stand at £65, the par value being £5.

I mentioned a few weeks ago that in some quarters there is a feeling that better times are in store for mining business, and I gave particulars of several new ventures. Since then several others have been offered to the public. One is the Dareheib & African Syndicate, Ltd., which is in the nature of an offshoot of the Egypt & Soudan Mining Syndicate, the company which works under the auspices of John Taylor & Sons. The present syndicate has been formed to take over the exploring rights in the Oneib district, southeast of Assouan. Richard Provis has reported for John Taylor & Sons, and gives details of many old workings where the veins are well worth following up. Another new issue is that made by the Middleburg Steam Coal & Coke Co. This is not a new company, but it is issuing another block of shares in order to expand its operations. The company owns collieries at Witbank, on the railway from Delagoa Bay to Pretoria. The company has had no difficulty in un-

derwriting the whole issue. A third new issue is that of the Oaxaca Gold & Silver Mine, Ltd., which has been formed to acquire a property in the district of Tlacocula, State of Oaxaca, Mexico. The prospectus states that the property is 20 miles south of the Great Southern railway, by which I suppose is meant the Mexican Southern railway. The mine has been worked by local owners for some time, and the rich pockets only have been extracted. The new company hopes to make a profit by treating the ore left in the mine, and to discover richer patches by further development.

Johannesburg. March 13.

Every one expected a big fall in the output for February, but a comparatively small decrease of 5,447 oz. is a pleasant surprise. Not only is it the shortest month but the Chinese New Year festivities at the beginning of the month reduced the working days by two. There is quite a substantial increase for the month, in the number of stamps at work, namely 276. The rate per day of gold production is higher in February than in January. The total output for the Transvaal, 363,811 oz., valued at £1,545,371, certainly proves that the industry is on the upward move. We have at last beaten the best pre-war record, so far as stamps are concerned, the number of stamps crushing in February being six ahead of the pre-war maximum.

The outlook for March is most encouraging, and another record will undoubtedly be chronicled. The unskilled labor market is especially good. There has been quite a rush of Kaffirs looking for work on the mines, and for the first time in years some mine managers have had the pleasure of telling the Kaffirs that their services were not required.

People are liable to come to false conclusions, and think that, as the Kaffirs are rolling in, no more Chinese coolies need be imported, as the black man has at last awakened, and will work constantly. Experience shows that the Kaffirs are erratic in their desire for employment. Just now their crops are a failure, and hundreds are forced to leave for the goldfields; but they will remain only a few months, get a little money together, and go back to their homes. In a few months' time it is not impossible that there will be a big drop in the number of Kaffirs looking for dork. No, as yet the native is unreliable, and he must be supplemented by the Chinese coolies.

A mine destined to be one of the great producers made its début in February, namely, the Village Deep, which reports 2,549 oz. gold won from 13,013 tons. Most of this rock was taken from the 'development dump ore,' and therefore the return appears low. No profit was made for this run, but a start has been made, the machinery has been 'broken in,' and no doubt in a few months' time the Village Deep will show substantial profits. At this mine, by a slight improvement in the mill, it is now possible to crush 6 tons per stamp per day, as against 5.2 tons in most mines.

This is the time of the year when most of the annual meetings are held. Last week was the meeting of the Bonanza, Ltd., and the report shows that this wonderful little mine is "not dead yet." At the last annual general meeting, it was stated that the ore reserves were 131,814 tons. During 1904, 100,150 tons were crushed leaving about 32,000. It now appears, however, that the estimate was very conservative, and that enough ore still remains to run the mine through 1905 at least, and possibly a few months in 1906.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. J. W. Abbott was in New York on April 7.

Mr. Robert T. Hill has returned from Mexico.

Mr. Edwin N. Hawkins, of Denver, is in New York.

Mr. E. M. Rogers is on his way to northern Nevada.

Mr. C. R. Wright, of Helena, Mont., is visiting in Mexico.

Mr. Walter Renton Ingalls goes to Mexico on April 18.

Mr. E. Nelson Fell has reached London on his return from Siberia.

Mr. Duncan McVichie has returned to Salt Lake City from New York.

Mr. E. N. Van Cortlandt is in New York, on his return from Nevada.

Mr. Otto Stalmann, of Salt Lake City, was in New York during the week.

Dr. Seth Gregory arrived in New York on the *Oceanic*, and is now at Denver.

Mr. F. J. Harrington is manager for the Quartette Mining Co., at Aspen, Nevada.

Mr. Lindsay Duncan has been retained as engineer on the Gunnison tunnel, in Colorado.

Mr. Martin Schwerin is at Cape D'Or, Nova Scotia, where he will remain until September.

Dr. R. W. Raymond has returned from his holiday, much benefited by a few weeks' rest.

Mr. Rupert C. Alabaster and Mr. F. H. Wintle sailed on the *Oceanic* for London on April 12.

Mr. D. C. Jackling has been appointed manager of Bingham Central Co., at Bingham, Utah.

Mr. John Dern has been appointed manager of the Lower Mammoth mine, in the Tintic district, Utah.

Mr. Hal W. Hardinge passed through New York on his return to Massie, Ont., from Prescott, Arizona.

Mr. P. G. Lidner, of New York, is on his way to examine the Tonopah and Goldfield districts in Nevada.

Mr. Robert C. Gemmell has resigned as superintendent of La Bonanza mine in the State of Zacatecas, Mexico.

Mr. J. L. Bryson has been appointed superintendent of the Goldfield-Badger mine, at Goldfield, Nevada.

Mr. J. B. Harris has been appointed superintendent of the José Gulch mine, near Butte City, California.

Mr. J. T. Franklin, of Waco, Tex., is in the State of Oaxaca, Mex., where he is developing a gold property.

Mr. E. W. Sebben is in the East on business connected with the erection of a metallurgical plant in Nevada.

Mr. Walter H. Weed, of the United States Geological Survey, lectured at Columbia University on April 6.

Mr. W. Murdoch Wiley, of New York, has gone to Guanajuato to inspect the Mineral Development Co.'s mines.

Mr. W. C. Potter, manager in Mexico for the Guggenheim Exploration Co., has returned from a visit in New York.

Mr. Robert B. Stanton has returned to New York from examining mines in Siskiyou county, Cal., and eastern Oregon.

Mr. W. C. Miller has been appointed general manager for the Federal Mining & Smelting Co., to succeed Mr. E. J. Roberts.

Mr. F. R. Baldwin, superintendent of the Maitland mine, of Deadwood, South Dakota, has returned from a visit to Chicago.

Mr. George W. Small, consulting engineer to Las Arcos Mining & Smelting Co., of Almoloya, Mexico, was recently at Denver.

Mr. Herbert A. Megraw, of Baltimore, has been appointed manager for the Montgomery Mining Co., at Candor, North Carolina.

Mr. Chester W. Purington was married to Miss Charlotte Wells at Amesbury, Mass., on April 6. He is now on his way to Denver.

Mr. George W. Maynard, of New York, has left Guanacevi, Mex., and gone to Carbo, Sonora, where he is examining mining property.

Mr. Loyal W. Trumbull, of Laramie, Wyo., has been appointed consulting engineer to the Strong Copper Co., of Leslie and Laramie, in Wyoming.

Mr. Samuel James, who has been appointed superintendent for Las Arcos Mining & Smelting Co., of Almoloya, Mexico, has left Denver for Almoloya.

Mr. M. L. Thomas has been appointed superintendent of La Bonanza mine in the State of Zacatecas, Mex., to succeed Mr. R. C. Gemmell, who has resigned.

Mr. S. H. Hoff has been appointed manager of the company which has recently purchased 10,000 acres of coal land in the vicinity of Mannington, Kentucky.

Mr. William Thompson, consulting engineer for the Velvet-Portland mine has returned to Rossland, B. C., from a professional visit at Ocampo, Mexico.

Mr. J. G. Davis, formerly geologist and mineralogist for the United States in Alaska, is now mining engineer for the San Pedro, Los Angeles & Salt Lake railroad.

Mr. H. E. West, formerly superintendent of La Leonesa mine, Nicaragua, has accepted a position on the staff of Mr. R. M. Raymond, general manager of El Oro mine, Mexico.

Mr. Edwin Higgins, Jr., of Columbus, O., will spend the month of April in southwestern Virginia, investigating zinc properties and opening up the mines of the Cedar Springs Zinc Co. (of Columbus, O.) His headquarters will be at Cedar Springs, Wythe county, Virginia.

Mr. N. L. Heinz, has resigned from the employ of the Matthiessen & Hegler Zinc Co., and will hereafter devote his attention to designing zinc and chemical plants. He has a contract with the Mineral Point Zinc. Co., at Depue, Ill., for the erection of a large mechanical roasting furnace.

Mr. Percy E. Barbour, of Boston, is in New Mexico preparing to move the 250-ton cyanide mill of the Cochiti Gold Mining Co. from Albemarle to Thornton, a distance of 25 miles. At least ten miles of road must be practically rebuilt before heavy machinery can be hauled over it.

Mr. Henry M. Howe, professor of metallurgy at Columbia University, has been elected foreign correspondent of the Society for the Encouragement of Industry of Paris, to succeed Sir Lowthian Bell. The other four living recipients of this honor are Messrs. Cannizaro, an Italian chemist; Mendeleef, of St. Petersburg; Solvay, of Bruxelles, and Sir Henry Roscoe, of London.

Obituary.

Guido Bodländer, professor of technology and electro-chemistry in the Technical High School at Brunswick, Germany, died on December 25, 1904; but the materials for a worthy notice of his life and work have come to hand only recently. Prof. Walter Nernst, the brilliant teacher of physical chemistry, recently promoted to Berlin, and the inventor of the Nernst lamp, contributes to the current number of the *Zeitschrift für Elektrochemie* an appreciative biography of Bodländer, and a list of his publications, which were many and which covered various subjects. Bodländer was at one time a colleague of Nernst at Göttingen. He received his doctorate at Breslau in 1902. His thesis 'on the optical properties of isomorphous mixtures of lead and strontium di-thionates' shows the early union of high theory with good technique that always characterized him. He was successively at Bonn (assistant in pharmacology), Clausthal (assistant in mineralogy), Göttingen (assistant in physical chemistry), and finally at Brunswick from 1899 to his death. Not only did he exhibit a high order of ability in investigation, but his rich personality showed itself in his brilliant lectures, which were illuminated with apt metaphor and illustration from far afield.

Among the more noted works of Bodländer were those on the formation of melilite in portland cement, his many communications on the properties of electrolytes, his text-book on chemistry, and his editorial abstracts of recent annual progress in chemistry. He was in his 50th year.

E. J. Schmitz, a leading consulting engineer and geologist, died in New York from apoplexy on April 5. He had been in ill health for ten years, the result of a railway accident. He was born in Coblenz, Germany, March 14, 1851, and was graduated with honor at the technical high school at Aachen. At 28 years of age he came to America, settling in New York, and from 1880 to the present time his professional experiences in this country, Canada, Mexico and elsewhere were most extensive, gaining for him high commendation from such clients as J. B. Haggin, the Copper Queen Consolidated Mining Co., Cooper, Hewitt & Co., Kountze Bros., Louisville & Nashville, Pennsylvania and Southern Pacific railroads, and many others. Some of Mr. Schmitz's best work was done in making a geological reconnoissance through the coal, iron and other mineral regions of the South, the data collected being subsequently read at the annual meetings of the American Institute of Mining Engineers, or published in the ENGINEERING AND MINING JOURNAL and other periodicals. Among his more important literary efforts, inspired by a keen knowledge of geology, were 'Contribution to the Geology of Alabama,' 'Geology and Mineral Resources of the Rio Grande Region in Texas and Coahuila, Mexico,' 'The Structure of the Richmond Coal Basin, Virginia,' 'A Geological Section of the Rich Patch Mountain, Virginia,' 'The Lead and Zinc Resources from Springfield, Mo., into Arkansas,' and 'The Pocahontas Coal Seam.' Mr. Schmitz also reported on numerous individual properties, and his fearless good judgment initiated the confidence that invariably influences the successful investment of capital. Personally he was studious, kind and honest in his convictions, and by the profession as well as his many friends his death will be deeply regretted. He leaves a widow, two daughters and a son.

Societies and Technical Schools.

American Chamber of Commerce in Italy.—This organization has been formed with headquarters at Naples. The officers are as follows: President, J. P. Spanier; vice-president, Waldo Story; treasurer, P. Alvino; honorary secretary, Homer Byington; secretary, Nicola Parisio.

Harvard University.—This university has invited Wilhelm Ostwald, professor of physical chemistry at the University of Leipzig to serve as lecturer in the first half of the coming academic year under the arrangement for an exchange of professors, which has recently been agreed upon by Harvard University and the German government.

Prof. Ostwald is regarded as one of the founders of the modern science of physical chemistry.

As an editor; in the publishing of his monumental works; and still more in the building up of the Institute of Physical Chemistry in the University of Leipzig, which has attracted enthusiastic students from all over the world, Ostwald stands for this science as does no one else.

Trade Catalogues.

The Pohle-Tetrault system of ore treatment is described in a booklet, issued by the Progressive C. & M. Co., of Reno, Nevada.

The Edward Christman Co., of Masillon, O., builders of high-grade drilling machinery, has issued an illustrated catalogue of its products.

The 'Broncho' channeler is described in form No. 322, issued by the Ingersoll-Sergeant Drill Co., of New York. The same company has prepared a booklet describing its air compressors.

The Eureka Fuel-Gas Co., of New York, has issued an advance circular describing the Adams-Powell continuous gas producer, an invention for the generation of gas from low-grade fuel.

Graphite for March, published by the Joseph Dixon Crucible Co., of Jersey City, N. J., contains, as usual, much interesting information in regard to the graphite products of that company.

The installation of chloride accumulators for the Edison Electric Co., of Los Angeles, Cal., made by the Electric Storage Battery Co., of Philadelphia, Pa., is described in Bulletin No. 88, issued by that company.

'Ideal Power,' published monthy by the Chicago Pneumatic Tool Co., of Chicago, Ill., is filled with much interesting matter relating to that company's products, and to matters connected with pneumatic power in general.

The National Electric Co., of Milwaukee, Wis., is sending out some handsome reproductions of its machinery, illustrating the Lundell 'universal' motors, and the Christensen air-brake equipments. The same company issues Bulletin No. 400, which contains a fuller description of the Lundell 'universal' motor.

The Morris Machine Works, of Baldwinsville, N. Y., manufacturers of centrifugal pumping machinery, has issued an unusually handsome catalogue of the centrifugal pumping machinery, stationary and marine engines. It contains an excellent reproduction of a photograph of the company's plant, and many illustrations of its machinery and their parts. Both descriptions and illustrations are prepared with the greatest care.

Industrial.

The Minneapolis Steel & Machinery Co. has secured from the Greene Consolidated Copper Co. the contract for building the company's new reverberatory furnace and ore-bedding plant at Cananea, Sonora, Mex. Between 600 and 700 tons of structural steel will be required.

The last official act of the Panama Canal Commission before resigning was to close a contract with the Ingersoll-Sergeant Drill Co., of New York, for 50 standard rock-drills of that company's manufacture, complete with mountings and equipment. These machines are to be used in the removal of rock in the great Culebra cut through the crest of the isthmus. The commission furthermore authorized the same company to remodel a large number of the French-Ingersoll drills, built in France under the patents of the American manufacturers. These machines remain from the original equipment of the old French company formerly operating on the canal.

The value of Albany grease for mining machinery is illustrated in the following extract from a letter received by Adam Cook's Sons, New York City, the makers, from W. L. Bradley, San Felipe, Mexico:

"I have been using your Albany grease for the past five years. I can say, and I think I am quoting every mining man of my acquaintance, that the 'Albany' is the best journal grease that can be had, and is considered perfection, being entirely free from grit or foreign matter and an excellent lubricant. Only last month I stood a heavy transportation charge both ways to return an order of grease which was sent me as a substitute for 'Albany.' I always insist on the 'Albany.'"

The shop employees of the Crocker-Wheeler Co., electrical manufacturers, at Ampere, N. J., have organized a beneficial association which has a number of novel features. Each employee who pays 10 cents a week to the association will be entitled to $10 a week, for 20 weeks, during incapacity through illness. If he dies, his family will receive $100. The payment of 20, 30 or 40 cents a week entitles him to $15, $20 or $25, respectively, with death benefits of $150, $200 or $250. The plan went into effect April 3. The company has offered to contribute an amount equal to the dues paid to the association. Thus if $6,000 are paid yearly in dues, the income of the association will be $12,000. The company does not require representation in the association, which will be run entirely by the employees.

The Wellman-Seaver-Morgan Company, with main office and works at Cleveland, O., announces that George B. Damon, who has been manager of the New York office, has been transferred to an important position in connection with the engineering and sales department at Cleveland, O., and that W. A. Stadelman, for the past 10 years manager of the Eastern office of the Brown Hoisting Machinery Co., has become manager of the general Eastern office of the Wellman-Seaver-Morgan Co., with offices at No. 42 Broadway, New York City. Mr. Stadelman is well known from his connection with the Sprague Electric & Railway Motor Co., as chief engineer of the Equitable Electric Railway Construction Co., general manager of the Bristol Belt Line Railway Co., and latterly in his connection with the Brown company. All inquiries and matters requiring attention convenient to the New York office of the Wellman-Seaver-Morgan Co. will have Mr. Stadelman's personal attention.

General Mining News.

American Smelters Exploration Co.—This company, recently organized in New Jersey, elected the following board of directors on April 10: Daniel Guggenheim, chairman; E. W. Nash, Barton Sewell, Murray Guggenheim, Isaac Guggenheim, A. Eilers, S. R. Guggenheim, Simon Guggenheim, Edward Brush, E. L. Newhouse Karl Eilers, S. W. Eccles, M. Robert Guggenheim, J. B. Grant, Dennis Sheedy, Franklin Guiterman and W. S. Morse. The directors appointed the following executive committee: Daniel Guggenheim, chairman; E. W. Nash, Barton Sewell, A. Eilers, S. R. Guggenheim, Simon Guggenheim, Edward Brush, E. L. Newhouse, Karl Eilers and S. W. Eccles. The officers elected were as follows: President, E. W. Nash; vice-president, Barton Sewell; treasurer, Murray Guggenheim; secretary, Edward Brush; assistant treasurer, F. W. Hills; assistant secretary, W. W. Porter; auditor, Judd Stewart.

ALABAMA.

JEFFERSON COUNTY.

Virginia.—The coroner's jury empanelled to investigate the explosion in this mine on Feb. 20, in which 111 men lost their lives, have returned a verdict as to the death of John Brown, one of the victims, holding that Everett T. Schuler and G. H. Schuler, of the Alabama Steel & Wire Co., owners of the property; Amos W. Reed, lessee and operator, and Sam Hartley, mine foreman, are responsible for the death, but without malice. By arrangements with the county solicitor, bond in the sum of $2,500 each was made by the men accused by the coroner's jury until the grand jury shall have made an investigation or a preliminary hearing given under the accusation of the coroner. The jury of the coroner decided that the explosion was known as a 'dust explosion,' caused by a 'windy shot,' and that certain warnings had been given previously. A number of witnesses were examined, and the report of the State mine inspector, made to the acting governor of the State, was perused. A number of damage suits have already been filed, and others are said to be in the course of preparation against the Alabama Steel & Wire Co., growing out of the explosion.

ARIZONA.

APACHE COUNTY.

Lemon.—This mine, at St. Johns, has struck good ore at a depth of 120 ft. in sinking. The ores carry gold and copper, and, in the latter metal, to the value of 10 per cent.

MARICOPA COUNTY.

Owynee.—This mine, in White Tanks district, has been a steady shipper of ore to the El Paso smelter during March. The best ore was encountered in the 300-ft. shaft, since which time both sinking and stoping have been prosecuted.

Little Jimmie.—This mine, at White Tanks, has a shaft down 70 ft. on ore of a shipping grade, but a small vein. Sinking is to be kept up to a depth of 150 ft., when drifting both ways on the vein will be done.

MOHAVE COUNTY.

New Century.—This mine, at Chloride, belonging to Hughes & Mitchell, is producing two carloads of ore a month from drifting and stoping on the 110-ft. level. Shaft No. 2 is also being developed with a good showing of ore.

Roger Boy.—This mine, on Cerhat mountain, belonging to E. B. Pyne, is under cover 200 ft. on the 115-ft. level. The ores carry good silver values, and go to El Paso at the rate of three carloads a month.

Leona.—This mine, near Chloride, is in a large body of very fair grade gold and silver ore, but will not ship at present. Developments are being pushed in a tunnel under the high hill to the southeast, which is gaining in vertical depth as work goes on.

PINAL COUNTY.

Wolfram.—This mine, at old Maricopa Wells, is in a body of wolframite ore, with half a carload on the dump and more in the 65-ft. shaft and drift. A sample carload will be sent to Pueblo, Colorado.

YAVAPAI COUNTY.

Octave.—This mine, at Martinez, has discontinued all operations, likewise the mill, although the old dump may be run through. It is said the mine will resume work in about three months. The cause for the shut-down has not been made public.

Limekiln.—This mine, at Harrisburg, has abandoned all work for the present but stoping and drifting on the 80-ft. level. The ore, while not in a distinctively large body, is of a fair shipping gold grade, which is being sent to El Paso.

CALIFORNIA.

AMADOR COUNTY.

McCann Mining Co.—This new company, with W. E. Stewart as superintendent, has been formed to operate this mine on the Mokelumne river, near Butte City.

Fremont Consolidated Mining Co.—In the Gover mine of this property at Drytown, Arthur Goodall, manager, they have found rich free gold ore on the 1,200-ft. level. The ore is so rich that it is sacked and worked separately from the ordinary milling ores. The 2-ft. vein carrying this ore was known before the mine closed down many years ago, but the new company on re-opening the mine failed to find it until now.

South Eureka Mining Co.—At the annual meeting of this company the following officers were elected: President, W. J. McGee; vice-president, F. W. Vowinckel; treasurer, Nevada National Bank of San Francisco; secretary, W. H. Miller; superintendent, B. B. Haven.

CALAVERAS COUNTY.

San Andreas.—At this mine, San Andreas, the shaft has been sunk through the lava to the gravel on the ancient channel. A heavy flow of water was struck, but a large pump kept ready for such an emergency is being put in.

Edward Black, Thomas Borden and Aug. McCann have uncovered a pocket near French Gulch a mile west of Murphy, from which they have thus far extracted $4,000.

EL DORADO COUNTY.

Landecker.—Prospect drifts have been under way in this mine some time, and pay gravel has now been struck in both channels.

Larkin.—The new hoist at this mine, Diamond Springs, has been completed, and the shaft is being retimbered before sinking 200 ft. deeper.

North Weber Land & Mining Co.—This company has been organized by S. H. Magness, A. S. and D. A. Bosquit, G. E. Pierce and N. W. Dacons, to work the Golden Hatchet mine on North Weber creek.

Rebel Hill.—At this hydraulic mine near Georgetown, the owners, Sturman and Zerras, are to put a force of men at work.

At William Rupley's gravel mine, at Smith Flat, a 10-stamp mill is to be erected. The gravel is cemented and requires crushing.

MARIPOSA COUNTY.

Grimshaw.—At this mine a force of 10 men is employed, and the shaft is down 200 ft. A crushing of ore is being made in the Organita mill.

Mount Gaines.—At this mine, F. E. Long, manager, they are crushing ore from the old dumps in a Huntington mill. Some development work is being done.

Champion.—This mine, at Mariposa, has been bonded to E. C. Van Meter, who has commenced unwatering it. The shaft is 200 ft. deep.

NEVADA COUNTY.

Union Hill.—It is thought that Messrs. E. M. Mellin and H. F. Quint, of Boston, and H. W. Graham have obtained a bond on this property and will pump it out in order to prospect and sample it.

SHASTA COUNTY.

Afterthought.—The new smelter of this mine, owned by the Great Western Gold Co., has been blown in. A steam railroad a little over a mile long connects the mine and works. This makes the third copper smelter operating in the county.

Copper Crest Mining Co.—This company has been organized in Los Angeles, with G. W. Branthoover as president. It is intended to work the Milton mine near Redding, and the Copper Crest and De Dalles group in Brushy cañon.

T. Doebler and associates of Lamoine have located five claims of asbestos 3½ miles northwest of Sims Station on the Southern Pacific railroad. One ledge is 13 ft. and another 16 ft. wide. The fibers are long and white, and the material is suitable for grinding up for filling.

SISKIYOU COUNTY.

Hogan-Nickeron.—This company, operating the Diamond Springs group of claims on China Gulch, has made a rich strike of specimen ore in the lower works.

TRINITY COUNTY.

Trinity-Siskiyou Gold Mining Co.—This is a new company formed by the consolidation of the interests of J. I. Gulick and the Swift Creek Mining Co. at Coffee. The holdings embrace 580 acres of mineral land.

Lappin.—For this mine, Deadwood, John Beatham, the manager, has purchased an air compressor to operate the Burleigh drills on the lower tunnel.

Quimby Creek.—An undivided one-half interest in this group has been deeded to J. A. Brent, who held an option. There is a stamp-mill on the ground, and over 40 men will be set at work as soon as weather permits.

TUOLUMNE COUNTY.

Horse Shoe Bend.—At this mine a night shift has been put on at the 90-ft. shaft, where the vein is increasing in value. At the Englewood tunnel four drills are in use.

Densmore.—It is stated that the recent strike in this mine is proving as rich as any ever made by former operators.

Brindle Pup.—Upon this mine, between Vine Spring and Doyle Ranch, a 4-ft. Huntington mill has been placed.

The Last Chance, Free Gold, Charles Haley and Wilbur quartz mines, near Jacksonville, have been bonded for $50,000 by F. A. McPherson and F. McCormick to E. L. Flower and J. B. Watson, who will develop the properties.

COLORADO.

BOULDER COUNTY.

Lincoln Mining, Milling & Investment Co.—Operations are being carried on with crosscut tunnel, a distance of 260 ft. has been gained and arrangements are being made by Manager Nelson, of Sugar Loaf, to install power drills for speedier development of property.

Fortune Dyke Mining Co.—This company has purchased from Boulder parties for a consideration of over $100,000 the Scotia group of claims, also real estate in the Gold Hill district.

Clinton Mining & Milling Co.—Shipments from the No. 4 tunnel at a depth of 700 ft. during the past month averaged $179 per ton net, and the company will soon add to its profits. Pennsylvanians are interested, and the property is credited with a production of over $500,000 during the past five years.

Wheelman Tunnel.—Arrangements have been made with the representatives of the United States Steel Corporation for the purpose of operating this property in the Sugar Loaf district, as several feet of tungsten ore have been found in the tunnel workings.

CLEAR CREEK COUNTY.

March Ore Shipments.—The shipments from Idaho Springs were 283 carloads, or 7,057 tons, showing an increase of 134 cars or 90% over the corresponding month for the previous year.

Oro Verde Mining & Milling Co.—Eastern parties who are interested in this company operating a large group of claims between Yankee Hill and James Peak, have agreed to furnish funds for the erection of a mill near the head of Silver creek during the coming summer months. G. P. Goodier, Yankee, Colo., is manager, and he is on his way from an Eastern trip.

Wide West.—A rich strike has been made in this property on Leavenworth mountain by Garbolino & Company, of Georgetown, in the 800 ft. station of the tunnel level. The ore as opened up is from 18 to 24 in. wide, and a test shipment of three tons brought returns of 763 oz. silver and 38% in lead.

Marshall & Russell Tunnel.—New Leyner drills have been purchased for this property at Empire station, and a contract has been given during the past week for 500 ft. of tunnel work, and the water power plant will soon be started up, owing to increased water supply in Clear creek.

St. Paul Mining Co.—New boarding houses and blacksmith shop have been built by this company and grading for the new power building has been commenced, though considerably hindered on account of the heavy snows. The company is driving a crosscut tunnel to open up its large group of claims and intends installing a power plant. G. W. Teagarden, Georgetown, is manager.

Arapahoe.—A recent snowslide carried away about 40 sacks of high-grade ore valued at $6,000 to the ton, as well as a number of tons of second-class ores. Hoffman & Company, of Georgetown, are operating the property.

EL PASO COUNTY.

General Metals Co.—The property of this company, near Colorado City, will be sold at public auction on May 10. It includes the Telluride mill building, its mill site and water rights, the Ryan ranch and water rights and various items of personal property.

GILPIN COUNTY.

Clay County.—British parties have purchased this property in Lake district, for a cash consideration. The owners were the American National Bank of Denver, and the deal was made by Dr. John H. Gower, of Denver, on behalf of the Englishmen. The property is equipped with machinery, shaft buildings, its main shaft is down 500 ft. and it is credited with producing several hundred thousand dollars' worth of milling and smelting ores. Active developments, including the deepening of shaft, are planned.

Delmonico.—Kentucky parties who are interested in this property on Quartz hill are arranging for the early installation of a compressor plant and additional boiler capacity. E. Steffan, Central City, is manager.

Bant.—This mining property, situated near Black Hawk, has been purchased during the past week by the Gower Mines Syndicate, Ltd., owning and operating the Running Lode property, and will be added to their Running Lode holdings. The price was a cash one.

Victoria.—Colorado Springs and Pueblo, Colo., parties are organizing a company for the operation of this group of mines in Lump gulch in the Central district, which are owned by Stevens & Company.

Huddlestone.—A lease and bond for two years in the sum of $20,000 has been given by the Drew estate to W. S. Bell, of Chicago, on the Huddlestone, Huddlestone No. 2, and Boomerang lodes, Central City and Quartz Valley districts, and heavy operations are planned by the lessee.

Nil Desperandum.—The installation of the water column is nearly completed and sinking should be resumed this week. Only 15 ft. of sinking remains to be done, and when this is completed drifting to the orebodies will commence.

Elk.—The drift at the lower level is being driven ahead on the vein of ore, which is small, but of good grade. The mine is shipping 150 tons a month, and the ore will average 8 oz. gold per ton. A larger body of ore is looked for when the drift is shoved in another 100 feet.

LAKE COUNTY—LEADVILLE.

The output for the month of March fell behind that of February, not because of the lack of ore, but on account of the poor condition of the roads, which are next to impassable, so that mines dependent upon wagons to haul the ore had to curtail shipments. The total output for all classes of ore reached 70,000 tons, of which there were 9,000 tons of zinc. The outlook for the present month, as far as new properties starting up, is very encouraging, and several shafts will start on Rock hill near the Reindeer, as well as on the Iowa gulch side of the hill. Others will also start on the Evans section of the camp, and as the snow disappears the owners of property near timberline will resume work.

Mosquito Range.—The recent strike in the South London mine has given an impetus to mining in this section, and nearly all of the properties within the vicinity of the London, not already working, will be in commission before long. The Moffat tunnel, in 500 ft., is driving to catch the extension of the London from South Mosquito gulch, and from the east side the Oliver Twist tunnel is being driven with the same end in view. The Famous group, which has been in litigation for seven years, was decided in the courts last week and the decision was in favor of the original owner, Mrs. Della Sinnot. The claims adjoin the London to the west and will now be developed.

Parson.—This mine, on Lower Rock hill, under lease to an English syndicate, has started to sink, and the first lift will be 1,000 ft. or to the blue lime. The machinery is arriving for the Frank shaft, and the work of sinking will start in a few days. At the Mike sinking is progressing favorably, and the shaft is now in the lake bedding.

Myrtle.—The shaft has been cleaned out and sinking has been resumed and will be sent down 400 ft. The object in sinking the shaft is to catch the Lecompton ore shoot that passes through this ground.

Yak Tunnel.—The electric drills will be installed at this property some time next week, and the results will be watched with a great deal of interest. During March the mine had to cut down the shipments to 7,000 tons, as the smelter was unable to handle a greater tonnage.

Resurrection.—During the greater part of the winter only development work was carried on at this property, and a large amount of ground was opened. During the week a force of men were put to work breaking ore, and the property from now on will ship 100 tons daily. When the mill starts 100 tons of concentrate will be added to the crude ore shipped from the mine.

INDIANA.

There are a half-dozen syndicates buying coal properties in Indiana, and it is believed that in time these will sell their holdings to one great syndicate, notwithstanding the agents of the different capitalists who are investing in coal land say that there is no such intention. The largest combination of mining interests in Indiana since the Deering deal was made April 1, when the New Pittsburg, Shelburn, Alum Cave, Gilmore, Green Hill, Citizens', Forest Hill and Indiana Hocking mines, owned by a company headed by J. K. Seifert, of Chicago, were sold to the Indiana Southern Coal Co., D. W. Cummings, of Chicago, president. The consideration was $2,000,000. The deal had been under way for some time, and it is said that this is merely the beginning and that the combine will be even greater than the Deering company. John R. Walsh, owner of the Southern Indiana railroad, is said to be back of the deal. These mines are in Vigo and Sullivan counties, while the Lattas Creek mine, in Green county, was on the day previous sold to Walsh for $250,000. It is reported that at least 18 mines on the Southern Indiana will be turned over to the owner of the road also during the next few weeks.

LOUISIANA.

CADDO PARISH.

Shreveport.—There are 13 derricks up here, and while operators do not expect a gusher-field, good pumping wells are anticipated. Land is selling at $150 to $250 per acre.

CALCASIEU PARISH.

Jennings.—The Bass & Benchenstein pipe line to the Mississippi is being laid at the rate of a mile per day, and it will be four months before it is in operation.

The Crowley Oil & Mineral Co. have obtained a permit for a pipe line between Egan and Crowley.

Moonshine Oil Co.'s No. 5, the latest gusher, is doing 7,000 bbl. daily.

There are about 5,000,000 bbl. crude in store, and the daily output has fallen to 25,000. Crude sells for 17c. to 20c.

MICHIGAN.

HOUGHTON COUNTY—COPPER.

Franklin.—Work at this mine is still suspended, owing to the strike of the trammers. The management says it is not prepared to meet the higher wage-scale demanded, and would rather keep the mine idle. Many of the workmen are seeking employment elsewhere, and it is expected those remaining will come to terms in a little while. Officials deny that the old Franklin mine on the Pewabic lode is to be abandoned. Some excellent mass copper is being secured from the 29th level. No. 2 shaft at the Junior branch is in good ground.

KEWEENAW COUNTY—COPPER.

Mohawk.—There has been a gratifying improvement in the productiveness of rock stamped during the last few weeks. Whereas the refined copper yield averaged only 17¾ lb. per ton last year it is now 18½ lb. Better ground is opening in No. 3 shaft, contributing to the improved yield, and the lower workings in No. 1 and 4 shafts are slightly better. Small shipments of the rich rock in No. 5 shaft help to increase the average.

ONTONAGON COUNTY—COPPER.

Mass Consolidated.—The management is considering the advisability of exploring the Minnesota lode, which traverses the southern end of the company's lands. It was opened in the early days of the district and some copper taken out, but it has never received any attention since modern methods have prevailed.

OREGON.

BAKER COUNTY.

Arrangements have been completed by which a narrow-gauge railroad will be built from Sumpter eight miles to the Bourne camp, with spurs to the E. & E., Columbia, North Pole and Golconda mines. The road will cost about $250,000 equipped, and will be completed and in operation this season. It will connect at Sumpter with the Sumpter Valley railroad, and will handle the large ore tonnage of the Bourne camps at greatly reduced cost to the mine owners.

Belmont.—A strike has been made in this group in the Greenhorn district, west of Baker City, by Gilkey & Kershaw, who took out $3,000 in gold from surface work on their property by pounding the quartz in a hand mortar. They only worked four days. This is considered a remarkable record, and has caused great excitement throughout that entire camp.

Daines.—These properties, consisting of the Belcher and Golden Gate groups in the Greenhorn district, are making good progress with a force of some 30 men in development work in the lower tunnels. President Daines is in the East on important business, and as soon as the weather opens here he will return and personally superintend the erection of the 20-stamp mill which is now at the railroad station, Tipton, eight miles from the mine. It is the purpose of this company to prosecute work in all departments with vigor this season.

TEXAS.

HARDIN COUNTY.

Saratoga.—The output has still further decreased. Nearly all wells are being pumped, though a few of the wells are being flowed with air.

Sour Lake.—The Davy Crockett Oil Co. is drilling a well on the Shoe String tract. Out of over 500 wells drilled in this field only 50 are being operated, and only one well, Texas Co.'s No. 43, just brought in, is flowing. The Texas Co., which is the largest property owner and operator here, is enlarging its pumping plant and erecting a machine shop. The output is 9,000 bbl. daily. Crude in tanks quoted at 30c. to 35c.

HARRIS COUNTY.

Humble.—On account of many of the gushers being flooded with salt water, the production here decreased to less than 25,000 bbl.; then new wells coming in sent it up temporarily to about 37,000. The following gushers came in since last report, and are good for about 2,000 bbl. each: Parafine Oil Co., No. 2; W. E. Brice, No. 1; Woods & Fonden, No. 2; Commonwealth Oil Co.; Batson Oil Co., Nos. 1 and 2; House & Beatty, Nos. 2 and 3. Crude sells at 15c.

JEFFERSON COUNTY.

Beaumont.—Crude advanced 4c. in the last two weeks, but the market is dull, and will remain so until Humble output reaches a definite basis. Production is still in excess of shipments, and crude will remain low until some substantial reduction is made in the large quantity of stored oil.

Development here will be stimulated by the bringing in of two wells, each good for 600 bbl. One well, owned by the Gordon Nelson Cecil Syndicate, is one-half mile west of Spindleton, and Guffey Petroleum Co.'s No. 57 is 300 ft. southeast of the Gordon well. West of No. 57 the National Oil Co. is drilling two wells, and the Warner Oil Co. is drilling about one mile nearer Beaumont.

UTAH.

BOX ELDER COUNTY.

Carrie Mack.—Some good ore has been developed in this property, which is located in the Newfoundland district.

Century.—At the annual meeting the shareholders, with a single exception, were re-elected. P. W. Madsen, of Salt Lake City, is the president and manager. The mill will be started up again about May 1.

JUAB COUNTY.

Tintic Shipments.—During the month of March, 659 cars of ore were dispatched to the Salt Lake smelters, the Centennial-Eureka supplying 357 of the number. During last week 151 car-loads were sent in, the shipper and the amounts being: Yankee Consolidated, 3; Uncle Sam Consolidated, 1; May Day, 2; Eagle & Blue Bell, 2; Centennial-Eureka, 102; Bullion-Beck, 9; Gemini, 14; Star Consolidated, 1; Victor, 1; Mammoth, 5; Grand Central, 9; Carisa, 2; total, 151.

Mammoth.—This Tintic property continues to supply the Salt Lake markets with ore to the extent of about a car a day.

PIUTE COUNTY.

Annie Laurie.—Connections have been made with the lower tunnel from the upper workings, through a raise from the former. After April 15 all ore taken from the mine to the mill will go out through the new adit, designated as No. 5 tunnel. This will do away with the gravity tramway.

SALT LAKE COUNTY.

Continental-Alta.—It is expected that the tramway and mill will go into commission some time next week.

South Columbus.—This property at Alta is developing satisfactorily. The directors at their last meeting decided to instal another machine drill and double the size of the air-pipe line. Air is supplied from the Columbus Consolidated compressor. An important change is anticipated in the tunnel within the next thirty days.

Cluster.—The development of this Bingham property continues favorably.

New England Gold & Copper Co.—Manager Henry M. Adkinson, of Bingham, is preparing to resume operations at the mill on April 1 with increased capacity. Developments made in the mine during the winter have been important. New orebodies have been opened; much of the ore is of a shipping grade. The control of this mine is owned by Mr. Williams, of shaving soap fame, and associates.

Boston Consolidated.—Shipments are being made at this Bingham property to the amount of 250 tons a day. Work in the Teck tunnel, being run to develop the low-grade porphyries belonging to the territory of the company, is progressing and has been completed to the length of 250 feet.

Columbus Consolidated.—From this company's mill at Alta is being forwarded about 20 tons of concentrate. This will be increased as soon as the roads improve.

South Columbus.—The main adit is completed to the length of about 1,100 ft., and the face shows strong mineralization. Several stringers of high-grade ore have been cut during the past week, showing values of 30 oz. silver, 33 per cent lead, $4.20 in gold and 2 per cent copper.

SUMMIT COUNTY.

Ontario.—A cave-in, the extent of which has not yet been ascertained, occurred in this drain tunnel at Park City on March 26, and as a consequence operations in the Ontario mine and mill have ceased. The mine has been filling with water, which will continue up to the 600-ft. level unless the stoppage in the meantime is removed. The company has taken prompt steps to remove the obstruction, which carries with it many attending dangers. The cave occurred at a distance of about 1,500 ft. in from the mouth of the tunnel. Should the stoppage continue indefinitely the Daly-West is in danger of filling up to the 1,200-ft. level and the Daly mine to the 900. The Ontario company has undertaken to drive a pipe through the fallen earth in the tunnel for the purpose, if possible, of ascertaining the extent of it. In event of failure, a tunnel will be run around the caved section. About 5,000 gallons of water has passed out of the tunnel per minute. The tunnel was built about 15 years ago.

TOOELE COUNTY.

Honerine.—The main shaft has reached the depth of 1,100 ft., and has encountered considerable water, necessitating the installation of a larger pump. A cross-cut is to be run toward the drain tunnel, which is coming in on the 1,300. When the face of the tunnel and cross-cut are even they will be connected by a raise from the drain tunnel.

UTAH COUNTY.

Tidal Wave.—Gold ore has been developed in this property, the location of which is near Provo. James Pierce, of Provo, is one of the principal owners.

WASHINGTON.

FERRY COUNTY.

Keller & Indiana Consolidated Smelting Co.—This company has graded a foundation 10 ft. wide and 1½ miles in length for a flume 5 ft. wide and 4 ft. deep, and will take water from the Sans Poil river for its mill-site at Keller, where a 50-ton sampling plant, a 100-ton copper matteing furnace and a 50-ton lead furnace will be constructed for the reduction of its own and custom ores.

OKANOGAN COUNTY.

Q. S.—This mine is on Æneas mountain, about half way between the towns of Loomis and Conconnully, on the east side of the Sinlahekeen river near Blue lake. The range of mountains at this point is very rugged and precipitous, marked upon the surface with reddish stain. On the summit of this ridge is a large dyke of copper-bearing ore, that has been exposed in several places, and a tunnel has been run several hundred feet to tap this dyke. Work has been for some time suspended, but it is understood that operations will now be resumed, and the tunnel continued until the orebody is encountered. The breast of tunnel now shows a highly mineralized formation and indicates that the ore is not far distant.

Bright Spot.—This group of claims is now being operated by Parkell and Finen, who were the original locators. Some years ago a company was organized to operate it, but through mismanagement it failed of success and the property reverted to the original owners. Since then a shaft has been sunk on a six-foot ledge, and assays made show values of from $50 to $60. A tunnel is now being run to cut this ledge at a depth of 200 ft. At a distance of 175 ft. a strong blind ledge, between a contact of limestone and shale, was encountered. The tunnel will be continued until the objective ledge is struck.

Security.—This property is located on the west slope of Palmer mountain. Extensive tunnel and stoping work has been done and much high-grade ore taken out. The ore is free milling and with the installation of the stamp mills near this mine this ore can be treated economically. N. Sabourin has completed contract for running tunnel 100 ft., and it is expected that another contract will soon be let.

Golden.—This group of three claims: Golden, Iron King, and Hidden Treasure, lies on Red mountain three miles from Golden. A tunnel is being run on a four-foot ledge which is traceable for a long distance on the Golden claim. This tunnel is now in the mountain 59 ft., and assays from the ore show an average value of $20. There are strong indications of a large copper deposit on the surface of the Iron King claim. Extensive development work is likely to be done on this property this summer.

Lake View.—This property is on Palmer mountain, near Palmer lake, and consists of five claims: Valley View, Baltimore, Boston, Brooklyn and Concord, and the preliminary work of incorporating a company to operate it is now in progress. A tunnel has been run on the Baltimore claim along a four-foot ledge, and another higher up the mountain on the Valley View claim on the same ledge. Assays taken from ore mined from these tunnels show values of $38 in gold.

Opal.—This property consists of eight claims, about two miles west of Chesaw. It is being operated by the Opal Gold Mining Co., which has run two tunnels, each showing large bodies of ore. Numerous assays show remarkable values. The installation of a cyanide mill in conjunction with the Ben Harrison mine will give facilities for reducing the ore now accumulated on the dumps, and further extensive workings are soon expected.

Foreign Mining News.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending April 1 were as follows, in tons: Granby, 13,140; Mother Lode, 4,256; Brooklyn, 2,702; Rawhide, 1,551; Mountain Rose, 198; Emma, 132; Oro Denoro, 66; Elkhorn, 20; Last Chance, 27; Skylark, 20; E. P. U., 20 tons; total for week, 22,132 tons. Total for year to date, 238,240 tons.

BRITISH COLUMBIA—KOOTENAY DISTRICT.

The Lanyon Zinc Co., of Iola, Kansas, is suing the Payne Mining Co., of Sandon, for alleged breach of contract in the delivery of zinc ores. The Lanyon company alleges that in January, 1904, it contracted with the Payne company for 500 tons of ore carrying 55% zinc or better, and that the actual delivery was below the specification in zinc. Later another contract for 200 tons of zinc ore was made, of which, it is charged, only 70 tons were delivered, and that was below grade. The Payne company puts up a defense that its delivery on the first contract ranged from 48 to 49% zinc, and the deficiency was offset by the penalty of 50 cents per unit named in the contract. As to the second contract, George Ransom, manager of the Payne company, declares that there was never any real contract between the Payne company and the Lanyon smelter, but that Alfred Garde, then manager of the Payne, and Thomas Jones, then ore buyer for the Lanyon, had some sort of an agreement which called for such a low figure that it was not a fair one. In other words, the contract was fraudulent, and the company was not bound by it.

The Silver King mine, at Nelson, B. C., one of the pioneer properties of the district, owned by the Hall Mines, Ltd., an English corporation, but leased to Montague Davies, will probably be developed on the deeper levels. The company will have a half interest with Mr. Davies in the new work.

W. J. Elmendorf, of Spokane, is consulting engineer for the Reliance Gold Mining Company, of Nelson, B. C., which is putting a 50-ton Hendryx cyanide plant on the May and Jennie group, at a cost of $40,000.

The St. Eugene mine, at Moyie, B. C., broke its own record in March by shipping 3,700 tons of concentrate. Of that, 2,300 tons went to Germany, 800 to Belgium and 600 to the Trail and the Nelson (B. C.) smelter. It is a silver-lead ore, concentrating four to one.

A. D. McPhee, superintendent of the McKinley mine, in Franklin camp, north of Grand Forks, B. C., has started with 10 men to start operations on a big low-grade gold-copper deposit. Should work fulfil expectations, a compressor plant, it is reported, will be ordered in 60 days.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

Rossland Ore Shipments.—Shipments for the week ending April 1 are as follows, in tons: Le Roi, 2,325; Center Star, 2,080; War Eagle, 1,410; Le Roi Two, 40; Spitzee, 120; White Bear (milled), 300; White Bear (milled), 30. Total for the week, 6,325; for the year, 88,024 tons.

DUTCH EAST INDIES.

SUMATRA.

Redjang Lebong.—Operations at this mine are to be extended under the charge of J. S. Truscott. The extension of the plant will include fine grinding of all the sand to slime, so that the poor sand extraction may be cut out, and the slime extraction, it is believed, will be materially benefited by the change. The company is now making arrangements to purchase the necessary machinery.

MEXICO.

SONORA.

Piedras Verdes.—This mine, in the district of Alamos, has been optioned to Moodie, Hardy & Harrington until Jan. 1, 1908.

ZACATECAS.

Alma Mining & Milling Co.—This company, at Zacatecas, is sinking the San Nicolas shaft at the rate of about 15 ft. per week, and the mill will be started up in a few days. It is a Los Angeles concern, and the president is P. B. McCabe. The company was formed in 1903 when the interests of C. A. Bentley in the San Antonio, San Luis and Torrington mines were taken over, together with the Rosario holdings, and merged into a stock company. A 100-ton concentrating mill has been erected, consisting of the following machinery: Two Elspass mills, one chilean mill, 12 new Standard concentrators, one Corliss engine, 150 h.p., and two return tube boilers of 80 h.p. each. At the San Nicolas shaft of the Rosario claims owned by the company a hoist and pump are at work, the power being generated by two boilers of 100 h.p. and 80 h.p. respectively. A large station pump which has been ordered is expected to reach the mine shortly and will then be installed. The bottom level is at a depth of 350 ft., and has exposed an ore shoot 600 ft. long, consisting of 2 ft. of first-class ore and 2 ft. of lower-grade material suitable for concentration in the mill. The first-class ore carries 100 oz. silver per ton to 150 oz., and consists of pyrites of iron with appreciable amounts of copper. The lower-grade ore is of a clayey nature, and also carries pyrites. It represents an almost ideal material for concentration and carries upward of 15 oz. silver per ton. There are hoists at both the San Antonio and Guadalupe shafts, and the small amount of water can be taken out in a week. The former is 450 ft. deep and the latter 550 ft. Work will be resumed at both places very soon. It has been proposed to matte the concentrate and high-grade sulphide, and a furnace, complete with blower, etc., with a daily capacity of 60-100 tons, is on the ground. The building for this furnace is partly completed, and can be finished in short order. It is proposed to run the concentrate and high-grade ores into a 1,000-oz. product, which can stand shipment anywhere. The mines are about 35 miles from the station of Canitas on the Mexican Central railway, in the State of Zacatecas. Experiments with cyanide are also being carried out at the mine to ascertain if it may not be possible to treat the concentrate and part of the ore by that process at a greater profit than either by smelting or shipment. A large dump of tailing from former work by the hyposulphite process is owned by the company, and contains upwards of 20,000 tons. This dump has been found suitable for cyanide treatment as a result of experiments made by Hugh G. Elwes, who is also testing the ores and concentrate with a view to their treatment. The general manager of the company is C. A. Heberlein.

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The Chemistry of Flame.

By Charles S. Palmer.

The addition in recent years to our knowledge of the mode of chemical activity centers unquestionably about the study of solution. To say that a solution, of barium chloride, for example, is chemically active, in the sense that the chlorine can be precipitated by silver nitrate, as silver chloride; that the same solution conducts electricity well; and that it shows abnormally high osmotic pressure as compared, in molecular equivalents, with less active substances such as chloroform—all these statements are only so many ways of saying that, in dilute solution, barium chloride is not to be regarded as *one* molecular unit, as suggested by the formula $BaCl_2$, but rather that there is an innumerable throng of ions of barium atoms, each with a double charge of positive electro-static energy, and twice as many ions of chlorine atoms, each with its single charge of negative electro-static energy (electrons). The ability of such solutions as barium chloride, and of all active acids, bases, and salts, to respond readily to precipitation or to act as electrolytes, rests essentially in this freedom of their respective part-molecules to move across the field with the divided tensions of the positive and negative factors of the electric current, or to leave the field as insolubles. The sensitiveness of the solution medium to the number, the concentration, the volume, and the temperature of the ions, has been carefully worked out; and the result shows a complete analogy with the simple and fundamental gas law, $PV = RT$.

All this might be almost too trite for reference were it not that the busy reader of this Journal may need a friendly introduction to the momentary study of gases and flames which we will briefly consider.

A flame is a stream of reduced gases which are mixing with oxidizing gases, and thereby becoming themselves oxidized. The light and heat are natural incidents resulting from the oxidizing of the combustible gas. The relation of the oxidizing and reducing properties of these various gases, as they are found in the various parts of the flame, is as old as metallurgy, and as beautiful as Faraday's 'Chemistry of a Candle' has pictured it. But another conception needs to be added to these qualities of the flame anatomy and physiology. The substances of flames are conductors of electricity, and thus we are at once enriched with new information regarding their properties. All that is necessary is to think of the flame space and substance as being a medium for new parts, molecules broken by dissociation into ions. These flame ions are perfectly analogous to solution ions, though they may not always be identical in composition; naturally the heat condition is different from that of a solution.

The conductivity of flame has been a subject for investigation for several years. It was attacked in Ostwald's laboratory at Leipzig in 1892, and recently F. L. Tufts (in a paper presented before the American Physical Society, Philadelphia meeting of December, 1904) has contributed some significant and valuable additions to the history of flames.

It appears that the parts of flames show great variation in carrying the electric current, the non-luminous flame being much more active than the luminous; therefore the non-luminous parts are media containing more dissociated-molecules or ions. Moreover, the non-luminous parts have an ionizing or dissociating power greater than that of the luminous parts. This is shown by spraying with a solution of common salt, when the conductivity of the non-luminous part increases in a ratio greater than is shown by the luminous part. But the non-luminous oxidizing part is hotter than the luminous reducing part; therefore it looks as though the heat were a prime condition for ionization.

The importance of this cannot be overestimated. Ionization is a pre-requisite for quick activity, and the non-luminous flame has been promoted to the rather limited list of active ionizers. Water, pure nitric acid, liquid sulphur di-oxide, and liquid ammonia almost make up the list for liquids. The list of the gaseous ionizers is not large at present. Indeed, flame has not yet been dissected and measured with that fullness that it deserves. But here is a field that promises more to the general theory and practice of dry metallurgy perhaps than any other discovery of recent times. Meanwhile it is well to familiarize one's mind with the conception of the ionizing medium seated in the hot, oxidizing, non-luminous flame.

Eutectic Copper.—The eutectic is that mutual mixture which freezes out last, after the ingredient which is, or the ingredients which are, in excess shall have been removed by gradual cooling. In the case of casting copper, some cuprous oxide is sure to be formed; here the eutectic is a mixture of copper metal and 3.4% of cuprous oxide, or 0.38% of oxygen. This eutectic can be seen under the microscope as a thin groundmass surrounding grains of pure copper. It is transparent; blue, in reflected, and red in transmitted light. This eutectic may be a source of weakness, as in copper tubes which carry hot and reducing gases, when the resulting action may form fine cracks by forcing the metal apart, a condition popularly known as the 'hydrogen disease' of Heyn. This general problem of the eutectic of copper, tin and oxygen has been the subject of a recent paper by O. Bauer in a recent number of the *Zeitschrift für angewandte Chemie.*

Underground Temperature.*

By James Stirling.

In 1898 the writer made observations of temperature at different levels in the deep mines at Bendigo, especially in the mine known as 'The 180,' then the deepest in the district. The observations were made in slate, sandstone, quartz veins and limburgite dikes, down to a depth of 3,250 ft. At the 180 mine the increase of temperature, from a line of no variation (about 80 ft. from the surface), was as follows:

454	ft.	was	1°	F.	for	every	100	ft.	in depth.
1,294	"	"	"	"	"	"	182	"	"
1,750	"	"	"	"	"	"	173	"	"
2,295	"	"	"	"	"	"	152	"	"
2,701	"	"	"	"	"	"	137	"	"
3,110	"	"	"	"	"	"	110	"	"
3,250	"	"	"	"	"	"	111	"	"

Assuming that the mean of these was the average increase with depth, we get 1° F. (or 243 ft. for 1° C.) for every 135 ft. The difference in temperature of the different rock substances at similar levels was almost inappreciable, except near fault lines.

In 1899 further observations were made in the deepest mines, the object being to prove that the heat of the rocks does not preclude mining operations at even 4,000 ft. in the Bendigo district, because, if the recognized formula were accepted, we should have a temperature of 125° F. at the 3,500-ft. levels. Observation shows that such a temperature is not reached.

The assertion sometimes made, that mining might extend to as great a depth as 10,000 ft., if haulage could be accomplished, is untenable. The difficulties would not be in haulage, but: (1) that of breathing under the enormous atmospheric pressure; and (2) increase of temperature. A mass of air in a down-cast shaft, of 60° F. at surface, at a depth of 10,000 ft. would attain a temperature of 90° by its own weight. It is possible to imagine a limit of 5,000 ft. as a workable depth at Bendigo; but healthful mining, even at that depth, would be hardly possible, if the gain should be as supposed.

The summary of recorded results is as follows:

Locality.	Feet Required for Rise of 1° C.
Calumet & Hecla (Agassiz)	402.6
Bendigo '180 Mine' (Stirling)	243
Maldon (Jenkins)	145
Ballarat (Jenkins)	144
Bendigo (Jenkins)	139
Someurty	118
Schladebach	114
Pittsburg	111
Spirenburg	105
Ruhr Coalfield	92
Saarbrucken	90

The mean result of the above would be 1° C. for every 154.5 ft. in depth. Excepting the abnormally low results at Calumet & Hecla, the accepted formula of 1° F. for every 60 ft. (or 108 ft. for 1° C.) in depth in the majority of the European and American localities, can no longer be maintained, as far as Victoria is concerned.

*Abstract from *Monthly Report*, Chamber of Mines of Victoria, Oct., 1904.

Safety Lamps for Belgian Coal Mines.

The experiment station erected by the Belgian government a few years ago at Frameries, under the supervision of Mr. Watteyne, director of mines, is undoubtedly the best of its kind in the world. It is equipped for investigating in a detailed and systematic way the dangers to which workers in gaseous and dusty coal mines are exposed. Mr. Watteyne, before beginning experiments, resolved to give attention chiefly to determining the best explosives for use in such mines, and the best devices for giving light to the miner.

The first important series of tests undertaken has fully established the value of the station, and shown the ingenuity and common sense of Mr. Watteyne and his assistant, Mr. S. Stassart. These experiments, which seem to settle definitely some vexed questions about safety lamps, are described in the 'Annales des Mines de Belgique,' Volume IX, and in a separate pamphlet,[1] published for the Ministry of Industry and Labor. So thoroughly did the experimenters carry out the tests, and so sound are their conclusions, that their work is summarized here.

The experiments were undertaken to show that certain government regulations for the use of safety lamps at Belgian coal mines, though deemed necessary from the evidence at hand when they were promulgated, had no longer any reason for being and should be repealed or amended. These regulations were those requiring: (1) The use of pure vegetable oil in safety lamps, dating from 1884; (2) the sending of all safety lamps that may be extinguished underground to surface, or to a re-lighting station on an intake airway; and (3) the use of the Mueseler lamp in gaseous mines to the exclusion of any other type, first recommended in 1840 and re-affirmed, after the reports of investigating commissions, in 1876 and 1884.

In the course of Mr. Watteyne's experiments, thousands of tests were made. A variety of lamps, from the old Davy to the latest-pattern Wolf, were used, those most thoroughly investigated being the Clanny, bonneted Clanny, Marsaut (a double-gauze Clanny), bonneted Marsaut, Mueseler, bonneted Mueseler, Fumat and Body-Firket burning oil, and the top-draft Wolf (practically a bonneted Marsaut) and bottom-draft Wolf, burning benzine. Tests were made of new lamps and lamps already used in the laboratory, while several types of lamps were tested under actual working conditions in a gaseous coal mine. The laboratory tests were probably the most severe and thorough of any to which safety lamps have been subjected, since they approached most nearly to possible mine conditions. Air carrying 6 to 10% of methane—not illuminating gas, used by most previous investigators—at rest and sometimes under a pressure corresponding to a mine depth of 4,500 ft. below sea level; the same explosive mixture charged with coal dust; currents of fire-damp, sometimes charged with dust, and having velocities up to 65 ft. a second, the lamps being exposed in turn to currents horizontal, vertically ascending or descending, and ascending or descending at an angle of 45°—these were the conditions used to determine some of the questions at issue. It should be noted that a velocity of 65 ft. a second is far in excess of that of any mine air-current, and the proportion of methane most used, 7 to 9%, makes the most explosive mixture. The underground tests of most value were those for determining the candle-power of different types of lamps, the results, as was to be expected, differing notably, with some lamps, from those obtained from new, clean lamps of the same make in the laboratory.

Vegetable Oil.—In commenting on the first problem investigated, the comparative safety of vegetable oil and benzine, Messrs. Watteyne and Stassart observe that the use of pure vegetable oil only in safety lamps in Belgian coal mines was probably required because of the fear of seeing inflammable and explosive substances carried into mines, and of seeing the safety of lamps decreased from the vapors given off in burning a highly volatile oil; and also because in some previous tests lamps using vegetable oil seemingly proved the safest. Hence, while the government made a slight modification of this requirement in 1899, vegetable oil, made from cabbage or rape seed, is still used in Belgium, although benzine-burning lamps were introduced at some German coal mines in 1883, and 20,000 such lamps have come into use at French collieries since 1899.

To settle any doubts as to the safety of burning benzine, two sets of new lamps were tested under identical conditions in the laboratory, one set burning pure colza oil, and the other benzine of a density of 0.72 at 60° F. The lamps were of three types: Single-gauze (Clanny), single-gauze bonneted, double-gauze, double-gauze bonneted (Marsaut, Wolf) and Mueseler. They were tried under varying conditions, including the severe ones previously mentioned. These points were noted as bearing on the safety of a lamp: (1) The first reddening of the gauze and the increasing intensity of the reddening; (2) the cracking of the glass; (3) the persistence of burning of the wick or of fire-damp within the lamp; (4) the heating of the lamp; and (5), in particular, the passage of flame through the protective gauzes so as to ignite fire-damp outside. In the course of the tests two facts were observed—one, noted by the English safety-lamp commission of 1868, that a brand-new lamp is not as safe as one that has been tested or used a while, because the new gauze has a slight coating of oil or grease, put on by the maker to prevent rusting, which facilitates the passage of flame; the other, that the safety of a lamp is lessened if the gauze has been in use a long while, especially if it has been brought several times to a red heat. This diminished safety is due to the oxidation of the wire, rendering it brittle.

To check results, a large number of experiments were repeated with lamps that had been used underground; and, as a farther check, tests were made of the same gauzes, the lamps being filled alternately with oil and with benzine.

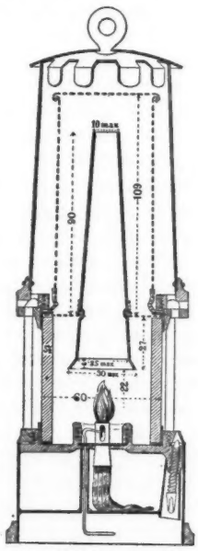
Lamp.	Height without bail, in.	Size of glass, in.	Weight ready for use, oz.	Average c.p. in laboratory.	Average c. p. in mine.	Limit of Safety, at
Mineri lamp, central wick	2.96	.....	13.2	0.51	....	.....
Mineri lamp, side wick	6.90	.....	16.3	0.53	....	.....
Davy	9.26	.....	28.0	0.18	....	13 ft.; 7%; horizontal current.
Clanny	10.24	2.36x2.36	45.3	0.59	....	13 ft.; 7%; " "
Bonneted Clanny	10.44	"	49.0	0.57	....	Above 17 ft.; 9%; " "
Unbonneted Marsaut	10.24	"	47.0	0.44	....	25 ft.; 7%; " "
Marsaut	10.44	"	50.8	0.40	0.34	Above 50 ft.; 7 to 9%; any direction.
Mueseler	10.24	"	46.8	0.43	0.32	10 ft.; 7 to 9%; ascending currents.
Bonneted Mueseler	10.44	"	50.5	0.40	0.32	Above 50 ft.; 7 to 9%; any direction.
Top-draft Wolf	11.62	"	54.6	0.57	0.46	" " " " "
Bottom-draft Wolf	11.62	"	58.5	0.87	0.75	" " " " "
Fumat	9.46	1.73x2.48	38.8	0.46	0.31	" " " " "
Body-Firket	9.26	2.16x2.08	40.0	0.22	0.20	" " " " "
Bainbridge	9.40	1.97 / 2.25 x3.75	40.7	0.79	....	.....
Special Wolf	10.24	2.36x4.03	45.2	1.22	....	.....

An important reason for preferring benzine to vegetable oil is the better light obtained. This advantage was determined by a careful photometric test of lamps newly lit, and lamps that had been burning 11 hours. Seven different types of lamps were tested for candle-power under working conditions, eight days' use in a flat, damp room, and nine in a flat, dusty room. Laboratory tests were made also of lamps burning vegetable oil with 15% of benzine, and vegetable oil with 15% of kerosene.

The general conclusions reached from these tests were: (1) That while on certain of the lamps some parts got hotter from burning benzine than from burning vegetable oil, and the glass might crack in currents of lower velocity, yet with most of the lamps there was no sensible difference in the resistance of the gauze, and for all practical purposes benzine burned in any one of a variety of lamps was just as safe as vegetable oil; (2) in regard to candle-power, it was noticed that the wicks of lamps burning vegetable oil

[1] 'Expériences sur des Lampes des Sureté,' L. Narcisse, Brussels, Belgium, 1904.

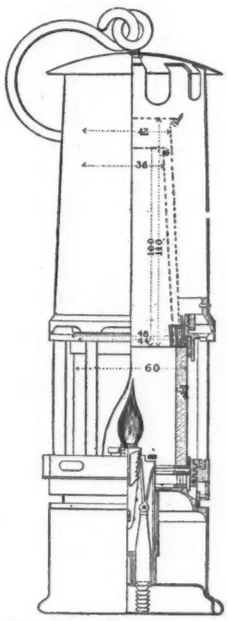
quickly charred, requiring frequent picking to get a good flame, whereas the wicks of the lamps burning benzine did not char. Allowing that the wicks of lamps burning vegetable oil were snuffed every 45 minutes, the candle-power in the intervals would average 10% less than that shown by a freshly snuffed lamp. All the new lamps, except the Mueseler, gave more light burning benzine than burning vegetable oil, the increase ranging from 14% for the Clanny to 40% for the Marsaut and the top-draft Wolf. The bottom-draft (air admitted below the glass) Wolf, which is not suited for vegetable oil, gave twice as much light as the oil-burning Mueseler. Underground tests of used lamps emphasized the superiority of the bottom-draft Wolf. A mixture of 15% of benzine or kerosene, with vegetable oil burned in a Mueseler lamp, decreased the candle-power, compared with pure oil, and had little effect on the light of a Marsaut —a widespread belief in the value of such mixtures to the contrary notwithstanding. (3) As benzine-burning lamps are as safe as those burning oil, as they give more light, and their light does not fall off as rapidly under working conditions, and as



MUESELER LAMP.

plenty of light is a protection against accidents to the miner, the regulation requiring the use of vegetable oil only should be repealed.

Internal Re-lighting Devices.—Another advantage of the benzine-burning lamp is its peculiar adaptability to the use of internal re-lighting devices. These, however, are evidently in opposition to a regulation which requires a miner to bring any lamp that goes out to surface, or to a re-lighting station. By this regulation a miner, when his lamp goes out, may have to take a long walk, or, if there are lamp carriers, he may have to wait some time; in both cases he suffers loss if working by the ton or by the yard. In consequence, he is often tempted to violate the regulation by unlocking the lamp, with a false key or in some other way, and re-lighting it, either by matches, or, as these are forbidden, by unlocking a lighted lamp. He does this believing that there is no danger from fire-damp, seeing no indications of any. Such violations of the rule are frequently noted by the government authori-

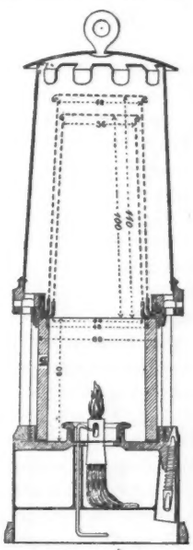


WOLF BOTTOM-DRAFT LAMP.

ties, in spite of strict watch and heavy penalties. In fact, serious accidents from this cause are rare simply because the air at the working face seldom carries enough fire-damp to cause an explosion unless dust also is present, and dust the miner can see. However, a safe re-lighting device would remove the danger, since no Belgian miner would think of smoking in a gaseous mine. In addition, a powerful reason for providing lamps with re-lighting devices is that in serious explosions, when lamps are extinguished, entries encumbered by falls and ventilating currents disarranged, miners groping in the dark may be asphyxated, while, if able to re-light their lamps, they can get by obstructions and readily escape. Any one who has been in a mine after a great disaster knows that many lives have been lost from the inability of men to find the best way out.

An objection urged against the use of re-lighting devices—which may be divided into explosive and phosphorus—is that a miner whose lamp has gone out may be suddenly surrounded by fire-damp from some outburst, without his knowing it, and, using the re-lighter, the gas within the gauze may burn with such violence that the flame will pass through the gauze, endangering himself and others. To test the validity of this objection, lamps with re-lighting devices were tried in most explosive mixtures of methane and air, with or without coal dust, still and moving; some of the lamps were new, some had seen service, and some were taken just as they came after several hours' use underground. As an extreme test, the gauze of a lamp was heated to redness by holding the lamp in a current of fire-damp, the lamp extinguished and the re-lighting device operated before the gauze got black. Some tests were made in a mixture of air and methane at rest, under a pressure corresponding to 6.5 ft. of water and having a temperature of 104° F. In some lamps the pots had just been filled with benzine, in others the benzine had been used up. Tests were made with lamps from which the inner gauze was removed, and with the same lamps, bonneted and unbonneted.

Explosive re-lighting devices have a strip of strong paper on which are small tablets or pastilles of an explosive compound, these pastilles being ignited either by friction against a steel point or by percussion. The phosphorus re-lighters consist of a strip of paraffinized tissue holding pastilles of phosphorus which are lit by the friction of a barbed draw-piece. It was recognized, from experiments made in Germany, that the explosive igniters might be the more dangerous, the shock



MARSAUT LAMP.

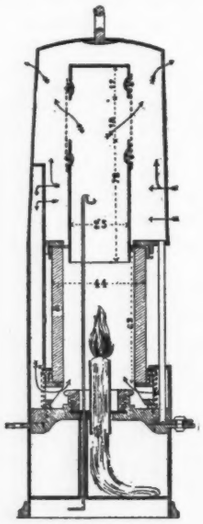
of an exploding pastille forcing the fire-damp through the gauze within the lamp, at the moment of its sudden ignition. This difference was confirmed. Explosive re-lighting devices were shown to be safe enough under the usual working conditions of a mine, but if any one of several factors were given sufficient value—for instance, a fire-damp current of high velocity—then the burning fire-damp might pass through the gauze. On the other hand, the phosphorus devices were shown to be absolutely safe even under the most severe conditions. Such re-lighting devices should not, however, be applied to all lamps; for instance, not to the Mueseler. The final conclusion was that the use of phosphorus re-lighters does not diminish in the least the safety of several types of

lamps, and that in mines using proper lamps equipped with such re-lighters the only regulation necessary regarding extinguished lamps is that a miner should not use the re-lighter when a lamp goes out from a fall or blow until he is satisfied that the glass is not broken nor the outer gauze injured.

Different Types of Lamps.—Perhaps the most interesting part of Mr. Watteyne's report is that which discusses the comparative merits of different types of lamps. Of the various lamps tested, the Clanny (called in Belgium the *lampe de Porion*) and Wolf are well enough known in this country, the Marsaut and Mueseler are not so well known, and the Fumat and Body-Firket are practically unknown.

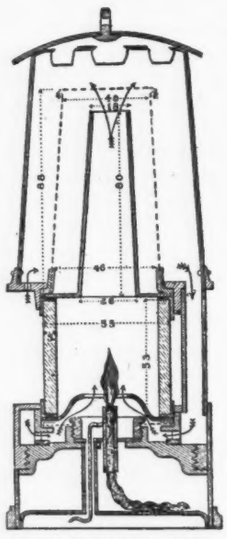
The Clanny is called too unsafe to be used in any mine where it is liable to meet currents of air carrying a perceptible percentage of methane. The same is true of the Davy. The double-gauze, unbonneted Clanny (Marsaut) is safer, but should not be used in all gaseous mines. Fire-damp currents having a velocity of 26 to 29 ft. a second are too much for the gauze, and a horizontal current carrying 7% of methane, and having a velocity of 20 ft. a second, can crack the glass. The same lamp with a bonnet (bonneted Marsaut) is remarkably safe. The gauzes resisted currents of the highest velocity used, 65 ft. a second, carrying 8% of methane, and striking the lamp either horizontally, vertically or diagonally. The pot does not heat, even in descending currents which reverse the circulation of air in the lamp. To crack the glass requires a horizontal gaseous current traveling 50 ft. a second, or a diagonally ascending one traveling 40 feet.

The Mueseler, the lamp required in fiery mines by the Belgian Government, was tested more times than any other type. This lamp has a tapering sheet-iron chimney, 4.5 in. high, supported by an annular gauze disk resting on the glass. The chimney and disk are within a protective gauze. The air entering the lamp has to pass through the outer gauze and the disk, while the products of combustion ascend the chimney and pass off through the upper part of the outer gauze. Under normal conditions, the lamp is as safe as a Marsaut, since no fire-damp can pass down the chimney; but, as previously noted, the lamp gives less light burning benzine—the products of combustion are not carried off fast enough—than burning oil, and is not suited for re-lighting devices, for the reason just stated, and also because, when filled with fire-damp, the sudden combustion of the mixture sends the flame up and outside the chimney, converting the lamp into a Clanny. Evidently, also, a reversal of the air circulation makes the lamp no safer than one with a single gauze. The tests at Frameries showed that this reversal occurs regularly in currents of fire-damp having a velocity of 10 to 13 ft. a second, and ascending at angles of 45° to 90°. The outer gauze withstands horizontal and descending currents of high velocity, but the glass is cracked in descending currents traveling 13 to 16 ft. a second. Some of these facts were noted at experiments in England as



FUMAT LAMP.

far back as 1867; also by a Belgian commission, and by various investigators since 1884. As ascending air currents are not rare in mines, it is by no means improbable that some terrible accidents in Belgium may have been due to the failure of a



BODY-FIRKET LAMP.

Mueseler lamp. Mr. Watteyne's results emphasized a fact previously noted—that the lamp could be fitted with a suitable bonnet, and, thus equipped, was as safe as need be; the gauze not reaching a bright red in fire-damp currents of the highest velocity, 65 ft. a second, and the glass not being cracked by a horizontal current of 50 ft. a second. The repeal of the government regulation relating to the use of the unbonneted Mueseler was, therefore, recommended.

Two patterns of bonneted Wolf lamps were thoroughly tested. One, here called the top-draft, is simply a benzine-burning Marsaut, with a re-lighting device, and a magnetic lock. This has practically all the safety of the Marsaut and gives a better light. The gauzes withstood tests in fire-damp currents of 65 ft. a second, and it required an obliquely descending current, traveling 40 ft. a second, to crack the glass.

In the other pattern, here called the bottom-draft, air is admitted below the glass, passing up behind a brass band, through openings in another, and through a double-gauze band before reaching the flame. The lamp is a little heavier than the other pattern, heats a little more, and thus volatilizes more benzine, but it gives more light. Its safety was tested most severely, and found amply sufficient. One lamp was exposed for 30 minutes to an obliquely ascending current containing 8% methane, and having a velocity of 60 ft. a second, without the gauze or the glass falling. The glass in another lamp was cracked by a horizontal current of fire-damp, free from dust, traveling 10 ft. a second; but in all safety tests of all the lamps the mere cracking of a glass was not regarded as rendering a lamp unsafe. No failure of the gauzes in the Wolf was observed in currents having a lower velocity than 50 ft. a second.

Two bonneted lamps, both burning oil—the Fumat and the Body-Firket—were thoroughly tested. The Fumat has a sheet-iron chimney with an annular opening, protected by a simple gauze, near the top. An air duct, polished on the surface next the glass to serve as a reflector, occupies about two-sevenths of the circumference of the lamp, and joins the bonnet to a circular passage below the glass from which the entering air passes through a double-gauze ring. The cross-section of the air openings being relatively small, the combustion is reduced, and for the same reason the gauzes are not traversed by the flame, even in fire-damp currents of high velocity. The lamp is small and light. On the other hand, it heats somewhat, and is easily extinguished by vertically ascending currents, a velocity of 2 ft. a second being enough with fire-damp, and 10 ft. with pure air.

The Body-Firket has a sheet-iron chimney, supported by an annular sheet-iron air-disk, and an exterior gauze. An air duct, also serving as reflector, connects the bonnet with a circular passage below the glass. From this the air passes by a series of openings through a single-gauze annular disk and then past a brass guard-ring, or cap, intended to direct the air against the flame. This lamp is in some ways the safest of those tested. No passage of the flame through the gauze was observed with fire-damp currents of high

velocity and different orientation; owing to the guard-ring, it is almost impossible to get the flame to crack the glass. From the small size of the holes admitting air the candle-power is low, and, in addition, the bonnet gets too hot for the hand.

Influence of Coal Dust.—In the tests at Frameries for comparing the merits of benzine and vegetable oil, the safety of re-lighting devices, and the weak points of different types of lamps, a large mass of data on coal dust was compiled. Tests were made in an atmosphere of fire-damp and repeated in fire-damp charged with finely powdered coal. The results clearly demonstrated that, while coal dust diminishes decidedly the illuminating power of some lamps compared with others, its effect in reducing the safety of a protective gauze is nothing, or next to nothing. Any lamp safe enough to use in air containing 7 to 9% of methane, is safe enough to use in the same atmosphere charged with coal dust.

Opinions of Miners.—Some opinions of miners who had used various lamps in their work underground, confirmed the observations of the laboratory staff. The bonneted Mueseler was said to give as good a light as the unbonneted, except in poorly ventilated places; the Marsaut gave as much light as the Mueseler, except in a dusty atmosphere; the Fumat burned well enough for an hour or two, but after that, particularly in a dusty place, its light failed rapidly and the flame smoked; the Body-Firket gave a fairly good light at the beginning of a shift, but frequently went out spontaneously after burning a few hours. The top-draft Wolf gave more light than the Mueseler under all conditions, but had a tendency to smoke in dusty air. The re-lighting device worked well, one trial usually being enough even in a damp room. The bottom-draft Wolf gave much more light than the Mueseler, and burned steadily during an 11-hour shift, needing no picking of the wick.

For lighting non-gaseous mines, the naked-flame lamp, so generally used, has these defects: It burns with a smoky flame which vitiates the air, goes out easily, is wasteful of oil, and is liable to start a fire. Two lamps examined at Frameries—the Bainbridge, burning oil, and a special Wolf, burning benzine—are open to none of the above objections, and give an excellent light. Both are, to a degree, safety lamps. The Wolf has a large glass and is without the magnetically operated lock used on the Wolf lamps for fiery mines. Its illuminating power is remarkable.

The weight, some dimensions, candle-power, etc., of various lamps tested at Frameries are given in the accompanying table. All the Wolf lamps burned benzine; the others, vegetable oil. Regarding the safety-limit figures, "13 ft., 7%" means an air current containing 7% methane, and having a velocity of 13 ft. a second.

The gauze in all safety lamps tested was of 1/3 mm. (0.013 in.) wire, with 144 meshes to the square centimeter (31 mesh).

In a final summing up of their conclusions, Messrs. Watteyne and Stassart observed that there is no such thing as absolute safety with a flame in a gaseous mine; lamps should be handled with prudence. As an illuminant, benzine is superior to vegetable or animal oils; lamps burning it indicate better the presence of fire-damp, give a brighter light, and fall off less in candle-power during a shift and can be fitted with re-lighting devices. Any danger from such devices is not to be compared with the increased safety assured by taking away from the men the temptation to unlock a lamp to re-light it, and giving them the certainty of a light when most needed—in some sudden danger necessitating a run for life. The bonneted Marsaut, Fumat, Body-Firket and Mueseler lamps burning oil, and the bonneted Marsaut (top-draft Wolf) and bottom-draft Wolf lamps, burning benzine, are safe enough for the most gaseous mines. The bottom-draft Wolf has withstood some remarkably severe tests, and gives the best light of all the lamps tried.

FIG. 2. BALANCE ROCK, CONCHEÑO TRAIL.

The small calorie or the gram-calorie of thermo-chemistry, which is measured on the centigrade scale, can be changed to the British thermal unit by multiplying by the fraction nine-fifths, the same that converts centigrade to Fahrenheit degrees of the thermometer; and, conversely, the British thermal unit can be changed back to the calorie by the factor five-ninths.

The Sahuayacan Dictrict, Mexico.

By Rufus M. Bagg, Jr.

The mining district of Sahuayacan lies in the extreme western part of the State of Chihuahua, about 140 miles by trail west of Miñaca, the terminus of the Chihuahua & Pacific railroad. The district is reached by way of Miñaca to Ocampo, 90 miles; to Moris, 20; to Sahuayacan, 25. It is customary to count distance by hours rather than miles; in terms of time it is 2½ days to Ocampo, 6 hours from there to Moris, and about 6 or 7 more to Potrerito, 3 miles east of Sahuayacan. An examination of the map will show the relation of this mining region to the surrounding country.

There are two prominent mines now being extensively worked. The Sahuayacan is the larger; it is shipping from $20,000 to $30,000 Mex. in bullion per month, mostly gold. Upon the north slope of the same mountain, the Santa Teresa mine is producing over $10,000 Mex. per month. Approximately two-thirds of the output is silver, and the balance gold. The ore averages about $5.50 gold per ton and from $10 to $15 in silver, but there are many tons of high-grade ruby-silver ore which is being set aside for later treatment. There is a 10-stamp mill, which crushes about 400 tons per month. This mine has been a steady producer since the construction of the mill in November, 1902. The mill at the Sahuayacan mine is much larger and far better equipped than any other mill in western Chihuahua, and, like the Santa Teresa mill, it is a stamp-mill provided with amalgamation pans and settlers, with Wilfley concentrating tables to handle the tailing. There is one other mine, the San Antonio, immediately to the south of this camp, which is producing in a small way extremely rich silver ore, and this *petanque* (antimonial silver ore) runs also high in gold.

Before describing the ores it may be best to review the geological features of this interesting camp. Two gigantic rhyolite columns rise above the mountain crests, one near Potrerito, the second near El Pilar. The latter is the more symmetrical; it also is higher, and more beautiful. Tall pines wave their foliage from its summit where no human foot has ever trod. It is 800 ft. high, and like a gigantic pencil shoots skyward with almost vertical sides. The western peak is known locally as the Pilar de la Cienega. It is 500 ft. in diameter and rises to about 600 ft. above the mountain crest. This column is twisted, and upon the north walls it shows the flow structure so frequently observed in rhyolites. It is more weathered and shattered than El Pilar, and lacks the perfect symmetry of the latter. Around the base of these gigantic buttes beds of volcanic ash and tuff cap the mountain crests and extend down the slopes toward the bottom of the gulches; these ash-beds become more coarse, and in places resemble

conglomerates, composed entirely, however, of volcanic fragments. Underneath the tuff, true acid eruptives occur, showing much free quartz both in veins, in vugs and in the ground-mass of the rock itself. No granite exists directly east of Sahuayacan, but the cañon extending east from the town to the Santa Teresa mine presents a most interesting phase of geological change. The silicious volcanic rock, chiefly quartz-porphyry, surmounted by the rhyolite buttes, is sharply cut off from the sedimentary series of shale and limestone which commences at the eastern edge of the Santa Teresa ground and extends for many hundred feet west. The mineralization of the district has taken place along this contact zone by the faulting and slickening of the shale and lime with the porphyry. The shale itself is mineralized for several feet along this contact zone, and assays $1.50 in gold and an equal amount in silver. The strike is N. 35° W. (compass), and the dip is southwest. The shale near this porphyry is black, very fissile, and is tilted nearly vertical; limestone bands and strata of minor thickness occur amid this shale in numerous places. There appear to be no traces of fossils, but the age of the beds is probably Paleozoic. The most interesting feature about these sediments is found in the extreme metamorphism which they have suffered; this is much stronger and more pronounced to the west. The soft fissile shale soon passes into slate, and this brittle slate becomes changed to schist of the chloritic type, and a little further on we observe true gneissoid rocks, everywhere cut with gash veins of white quartz in bands roughly parallel to the bedding planes. On the same mountain south of this cañon there are lenses of quartz carrying ruby-silver ores, also rich in gold, but they are narrow, often only from two to six inches.

In the cañon itself the quartz does not look mineralized, except in a few places. The transition into gneissoid strata from shale must have been rapid, for the change took place within a distance along the *arroyo* of less than one mile, and the structural relations are largely preserved. It would appear, from a limited study of the region, that the 'pillars' could not have produced the intense metamorphism which these sediments have suffered since their formation. The pressure must have come from the westward, but the mineralization appears to have been due to the disturbances caused during and by the formation of the pillars. At El Pilar, east of Sahuayacan, the mineralization is marked by veins that are very narrow and are more pronouncedly true fissures than the main brecciated fault-vein of the Santa Teresa mine, which averages at least 8 ft. in width.

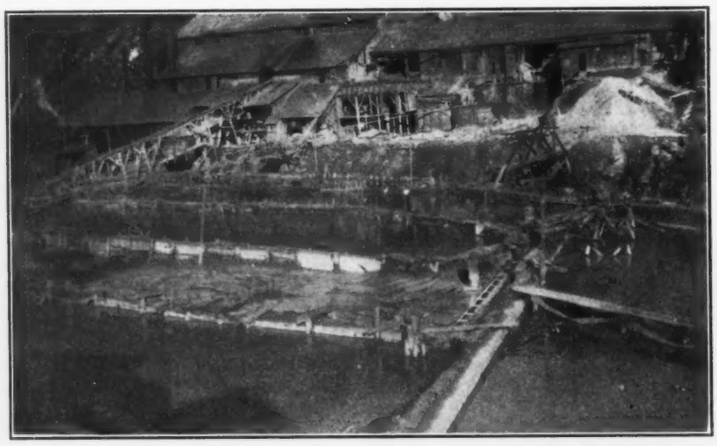


FIG. 6. CONCHEÑO MILL.

The ores found in the Sahuayacan mining district are nearly all the antimonial silver minerals called *petanque* by the Mexicans; in order of abundance they are stephanite, pyrargyrite and proustite, the arsenical form being far less abundant. The simple sulphide of silver, argentite, occurs also near the surface. The ruby silver in the Santa Teresa mine appears to have been formed contemporaneously with the quartz intrusions; it is accompanied by a large amount of finely crystallized iron pyrite scattered through the quartz. In some places the *petanque* has developed into solid cores or bunches of rich mineral surrounded by white quartz, and along the western hanging wall, and through the vein itself in some places, fragments of shale are included in the vein-filling proper. This shale is in angular fragments, as in brecciated material, and is much more like a true slate than the softer shale along the contact.

FIG. 4. CONCHEÑO FALLS, FROM OCAMPO TRAIL.

While the foot-wall is sharply defined and shows some evidence of slickening, the fault-planes are not strongly defined, and I believe that the fissuring played a more important part in the vein-filling than the intrusion of the quartz along fault-planes. In the Sahuayacan mine the ore is more brecciated, more oxidized, and the values run much higher in gold and less in silver, this difference becoming apparent in the color of the bullion. From this Sahuayacan mine, which lies just northwest of the Santa Teresa on the north of the same mountain, have come magnificent specimens of free gold in quartz.

FIG. 1. FORDING THE MORIS RIVER.

The views given with this article were taken along the route going west from Miñaca. Fig. 1. Fording the Moris river

in March, 1905. This river is high enough and the water swift enough to be considered dangerous during heavy rains. For some days it cannot be safely forded. Fig. 2. Balance rock, Concheño trail, between Miñaca and Ocampo. This rock is composed of volcanic tuff, and is five or six miles south of Concheño, and six hours from Ocampo (Jesus Maria). Fig. 3. Typical wayside cross such as is found at

FIG. 5. SAHUAYACAN MOUNTAIN SCENERY.

nearly every mountain crest along the trail. This monument is on the continental divide east of Ocampo, and the altitude is about 8,100 ft. The timber is mountain pine, which is large and abundant to the east of Ocampo for many miles. The white patches in the background are snow fields. This had just fallen as we passed through in March. Each passer-by adds his stone or stick to the pile, and in time it becomes a landmark. Fig. 4. Concheño falls, near the Concheño mine, on the Ocampo-Miñaca trail. Fig. 5. Sahuayacan mountain scenery; El Pilar just shows at upper left side. Fig. 6. Concheño mill, at Concheño mine, six hours northeast of Ocampo. This mill handles per month 4,000 tons of ore, averaging $15 in gold; silver is also present in small amount. The slime and settling vats are shown in the foreground.

Red phosphorus may be used in making phosphor-tin.

Pure methane, or 'marsh gas,' was made by Moissan from crystallized aluminum carbide. When cooled by liquid air it solidifies at first to a clear glass, which soon breaks down into crystalline needles, which melt at minus 184°C., and boil at minus 164°C. The purest form obtainable has a mild garlic odor, "which cannot be attributed to impurities." The pure solid methane is attacked by liquid fluorine, and explosively, at minus 187°C., similarly to the action of the solidified halogen on liquid hydrogen. Thus chemical affinity persists in low temperatures. This marsh gas, it must be remembered, is the fundamental hydrocarbon.

Mineral Industry of New South Wales.

The Under-Secretary for Mines has supplied advance particulars relative to the progress made by the mineral industry during the year 1904. Mr. Pittman states that the aggregate value of the production of the mines of this State to the end of 1904 is £157,315,659. This is exclusive of the value of the gold, copper and tin refined in this State from imported ores. The value of the mineral output for 1904 is £6,402,558, and is an increase of £286,304 on that of the previous year. The total number of persons employed in and about the mines of the State during the year is estimated at 37,837, and is 278 in excess of the number employed in 1903.

FIG. 3. WAYSIDE CROSS ON THE TRAIL.

The value of the plant in operation at the metalliferous mines, and including the dredging plants, is £2,031,436.

The gold won in this State to the end of 1904 is estimated at 12,258,384 oz. fine, valued at £52,070,273. The yield for the year 1904 was 269,778 oz. fine, valued at £1,146,109, and shows an increase of 15,557 oz. and £66,080 in value, as compared with the previous year. Cobar maintains its position as the principal goldfield of the State, and the production for 1904 amounted to 61,730 oz. fine, valued at £262,213. This is slightly below the yield for 1903, and is accounted for by the restricted operations of the Cobar Gold Mines, Ltd., during the closing months of the year. The Mount Boppy gold mine has contributed an extensive output and ranks as the premier gold mine of the State. Wyalong is the field next in importance, the yield for the year amounting to 25,895 oz. fine, valued at £109,993, which is the largest since 1900. Rich sulphide ore is being won from the deep levels, and this has given a marked stimulus to the field. The Hillgrove field has supplied a substantial increase, and other divisions from which satisfactory yields are recorded are: Araluen, Forbes, Wellington, Orange, Adelong, Stuart Town, Peak Hill and Pambula. The quantity of alluvial gold won is in excess of that of the previous year, but it is a noticeable fact that 'fossicking' was not nearly so extensively followed as in previous years.

The value of the yield obtained by the dredges during the year was £149,836, or an increase of £25,473 on that of the previous year, while the total value of the yield for the past five years amounted to £503,718. The Araluen division is still the principal center of gold-dredging operations, and during the year the 14 plants at work won gold to the value of £64,256. The dredging for tin is now a firmly established industry, and the quantity of tin ore saved by these plants during the year amounted to 319 tons, valued at £26,180. The number of dredging plants in commission at the end of 1904 was 42, valued at £235,576.

The value of the exports under the head of silver, lead and zinc during the year is as follows: Silver, silver-lead, concentrate, ore, etc., £2,065,540; lead (pig, etc.), £65,964; zinc (spelter and concentrate), £117,978, a total value of £2,249,482. The output for 1904 shows an increase of £622,906 over that of 1903 and £751,020 over that of 1902. The record of the Broken Hill mines for the year is one of

marked improvement and gratifying progress. A noteworthy feature is the success which has attended the efforts to turn to profitable account the by-products which have accumulated to such a vast extent during past years. This is evidenced by the fact that the value of the zinc-concentrate exported has increased from £10,625 in 1902 to £117,978 in 1904, and with the numerous processes now in use an extensive output in the future seems assured. The mines at Yerranderie (The Peaks) have also contributed an increased output. The total value of the production of the silver-lead mines of this State to the end of 1904 is estimated at £38,252,306. The number of men employed in this branch of the industry during the year was 7,071, or an increase of 1,036 in comparison with the year 1903.

The value of the output of copper from the mines of this State during the year is estimated at £420,387, and falls short of that recorded for 1903 by £42,253. The decrease is accounted for by the closing down of the Burraga mine during the last five months of the year. The returns from the Cobar and Nymagee divisions show that the copper-mining industry is making very satisfactory headway, and as the Burraga mine has resumed work, a considerably augmented output should be recorded during the present year. The value of the copper obtained from the mines of this State up to the end of 1904 is estimated at £7,170,085.

Tin and tin-ore to the value of £184,785 were produced during the year 1904. This is the largest output for the past 15 years. The sustained price of this metal has stimulated operations, and a large number of men found profitable employment, particularly in the Tingha and Emmaville divisions. The dredges have also materially contributed to the output, the value of the stream-tin won by these plants during 1904 being, as already stated, £26,180. The value of the output from the tin fields of this State to the end of 1904 is estimated at £7,259,063.

The quantity of coal raised during the year 1904 was 6,019,809 tons, valued at £1,994,952, and is a decrease of 335,037 tons and £324,708 in value, as compared with the previous year. The export trade exhibits a marked decline, and the shipments to foreign ports show a shortage of 662,399 tons, and to Australasian ports 150,928. There has, however, been a satisfactory increase of 478,290 tons in the quantity consumed within this State. The number of persons employed in this branch of the industry during 1904 was 14,034.

The value of the coke manufactured in the twelve months amounted to £110,692, and is an increase of £1,928, as compared with the year 1903. This industry has benefited by the improvement in metalliferous mining, but the price obtained for the commodity was lower than in the preceding year, and consequently only a small increase is shown in the total value of the production.

The kerosene shale raised during the year was valued at £26,771, which is less by £1,846 than that of the output for 1903. The only mine worked during the year was the New Hartley at Capertee.

The value of the other metals and minerals produced during the year is as follows: Alunite, £925; antimony, £503; bismuth, £12,329, chrome, £1,268; cobalt, £60; diamonds, £11,620; iron (from scrap), £80,504; iron oxide, £239; ironstone flux, £6,628; limestone flux, £14,434; lime, £13,-250; portland cement, £54,750; marble, £1,600; molybdenite, £2,726; opal, £57,000; platinum, £1,070; scheelite, £1,406; wolfram, £8,432; sundry minerals, £637; making up the total given above.

Iron Production in France.

The preliminary returns of iron production in France in 1904 show that the output of the blast furnaces was: Foundry iron, 553,715 metric tons; forge and steel pig, 2,446,072 tons; total, 2,999,787 tons, an increase of 159,270 tons, or 5.6% over the preceding year.

The production of wrought, or puddled, iron was 554,632 metric tons, of which 33,932 tons were sheets and 520,700 tons bars, shapes and other forms. The total showed a decrease of 44,278 tons, or 7.4%, as compared with 1903.

The production of steel ingots for the year was 2,080,354 metric tons, an increase of 240,726 tons, or 13.1%. This includes both bessemer and open-hearth ingots. The output of finished steel compares as follows:

	1903.	1904.	Changes.
Rails.....	229,071	246,339	I. 17,268
Sheets and plates..	292,544	299,376	I. 6,832
Other forms.....	784,094	936,993	I. 152,899
Total.....	1,305,709	1,482,708	I. 176,999

The production of converter and open-hearth steel is not reported separately. The ratio of steel to pig-iron production was 69.3 in 1904, against 64.8 in the preceding year.

The filament of the osmium lamp is about 11 in. long; that of the tantalum lamp is nearly twice as long.

There are already a half dozen plants in this country for the manufacture of sulphuric acid by the contact process. There are no less than sixteen of these in Europe, two in South Africa and one in Chile. The product is a high-grade acid, and while it is peculiarly adapted to such work as the manufacture of dye stuffs, nitropowders and other chemicals, which can bear the burden of expensive preparation, yet the acid is also making its way with that from the lead-chamber. It is so pure and concentrated that it can stand freight charges better than the cheaper commercial article.

Precipitation of Gold from Cyanide Solutions.*

By W. J. Sharwood.

The cyanide process for extracting gold and silver from ore and tailing has been practiced on a large scale for about 15 years. Numerous methods of increasing its efficiency suggest themselves, some dealing with mechanical problems, others with the dissolving of the precious metals, and others with the equally important question of getting them out of the solution again.

One point is to be noted. Most other processes in metallurgy consist of a series of steps, in each of which the valuable content of the original material is concentrated. In the cyanide process, on the other hand, the dissolving of the gold generally gives us a solution poorer than the original material treated. For instance, at one plant over 1,000 tons of solution are precipitated daily, of an average value of less than 50c. per ton in gold, or less than one part of gold in a million. From solutions so dilute as this it is not as easy to secure a high percentage of precipitation. Moreover, there is another phase of loss which may be shown in a familiar illustration—if we take a jugful of molasses and turn it upside down we can pour out three-quarters, or perhaps a little more, easily enough, but the stream becomes smaller and smaller, until finally it falls a drop at a time; and, no matter how long we wait, a little will stay in the jug. So with the gold in a cyanide solution—the greater portion of it can be readily precipitated, but it is a more difficult matter to get out the last few per cents, and almost impossible to extract the last trace.

One often hears the expression, "precipitation at this plant is practically perfect," when, as a matter of fact, 20 to 30 cents' worth of gold may be left in every ton of the solution. As the solution is to be used over again, this gold may not at first sight seem worth troubling about, but it must be remembered that it is impossible to recover all of the solution run upon a charge; whether it is leached or agitated, a certain proportion is retained, no matter how thorough the washing, and especially is this source of loss to be considered in the case of solution which is to be added just before the 'wash water' of the leaching process, or in any of the later 'washes' of a decantation system. The question as to how closely it pays to precipitate should be looked into carefully; a comparatively rich solution may be run with safety upon a free-leaching charge in its earlier stages, but solution added toward the end should have been precipitated as nearly perfectly as possible. In the decantation process it is easy to calculate how large a proportion of any particular wash is going to be thrown away with the residues.

*Abstract of a paper read before the Thirteenth Annual Convention of the California Miners' Association, December, 1904. From advance proofs.

Methods of precipitation may be classified as follows:

1. Precipitation by salts or acids, or by passing gases into the solutions. These methods render the solution unfit for use in treating further quantities of ore unless some regenerative treatment is applied. Hence, as a rule, they are only available for solution which is to be run to waste.

2. Filtration through charcoal is in use in certain parts of Australia, the material being revived by occasional re-burning, while a clean-up is conducted by burning the coal and fluxing the ash.

3. Precipitation by an electric current. This may be applied in two ways—first, to the clear solutions obtained by the leaching or decanting process; second, to the cyanide pulp itself while in course of agitation, as in processes of the Pelatan-Clerici class.

4. The more electro-positive metals or their alloys can be used; aluminum, sodium amalgam and zinc are about the only ones economically possible, while only zinc and its alloys have so far stood the ordeal of practical work.

The Siemens-Halske process consists in precipitating the gold and silver by the electric current, the solution being passed in a continuous stream through a large tank divided into several compartments, each of which contains a number of large sheets of metal forming the electrodes. Originally the anodes were of sheet iron, and the cathodes on which the gold deposited were of thin sheet lead. When a sufficient amount of metal had collected the lead sheets were melted and refined. The more recent plan is to have the anodes of lead coated with lead peroxide (which is not attacked by cyanide as the iron was), and the cathodes of tinned iron. The gold deposits on this in a finely divided condition and collects in the bottom of the tank, from which it is removed at intervals, the metal sheets being permanent. From 6 to 12% of the theoretical precipitating efficiency of the current is said to be obtained in practice.

Another electrolytic system uses iron plates, covered on one side with a carbonaceous coating, the gold being deposited on the unprotected side. The tank is filled up with solution; this remains until practically all the gold is precipitated, when the solution is drawn off and a new batch is run in. The process is, therefore, an intermittent one.

The electrolytic system has the advantage of precipitating copper out of the solution, and as each pound of copper keeps from 3 to 4 lb. of cyanide in an inactive condition as regards dissolving gold or silver, the removal of this metal regenerates a considerable amount of the cyanide.

Precipitation with aluminum removes gold and silver, but the metal has a tendency to oxidize, is more expensive than zinc and has not come into practical use. Precipitation with sodium, in the form of amalgam, has several theoretical advantages over zinc. When the sodium replaces the gold in the solutions it regenerates the cyanide; a certain amount of caustic soda is also formed, which helps to keep up the alkali in the solution. The difficulty in using it appears to be mainly in getting a sufficiently large surface of sodium amalgam in contact with the solution, when large tonnages of solution are to be precipitated. The amalgam may be made by addition of metallic sodium, or more cheaply by electrolyzing common salt or sodium carbonate with a mercury cathode.

Zinc shavings continue to be used at most plants, the solution running in a continuous stream through the boxes containing them. They have proved satisfactory, when the attempt has not been made to crowd too much solution through the boxes; but occasionally the shavings become coated with gold or copper, or become covered with a white material which prevents the solution coming into contact with the zinc. As a rule, the latter condition is prevented by having more free cyanide or free alkali present, and dipping the shavings into lead acetate before use, gives them a coating of lead which sets up galvanic action and aids precipitation.

Zinc dust or 'zinc fume' has not so far been introduced at any of the California cyanide plants. It is, however, employed at several large plants in other Western States. Zinc dust is a product obtained in reducing zinc from its ores; as the metal is distilled from the retorts, a certain proportion condenses in the form of a powder consisting of minute globules of metal coated with oxide. Owing to the fineness of its particles this material exposes a large surface and is well adapted for use as a precipitating agent. The method of employing it at the larger plants is to collect the solution flowing from the sand-vats in two or more tanks; when one of these is full it is agitated for a few minutes, and a suitable quantity of the dust is introduced, either by scattering it in a dry form on the surface or spraying it in as an emulsion; the mixture is then forced by a pump through a filter-press, from which the barren liquid flows to the storage tanks, while the precipitated metals and any excess of zinc are retained in the press until the clean-up. The percentage of cyanide having been determined before precipitating, the proper weight of cyanide to bring a tankful up to working strength can be calculated and placed in the launder leading from the press, where it is dissolved by the flowing solution. The zinc dust and precipitate form a porous mass, which offers slight resistance to the passage of solution, and the pressure in the press is small if the liquors precipitated are clear, so that the chambers or frames may be proportioned to form cakes several inches thick. If, however, the solutions carry suspended slime, such as sometimes forms when solutions differing greatly in alkalinity are allowed to mix, there is a tendency to clog the filter-cloths and increase the pressure on the pump. As the solutions have to be pumped up to the storage tanks, whatever method of precipitation is adopted, there is no great increase with this system in the power required.

From one-sixth to one-third pound of zinc dust is used per ton of solution, while about six tons per hour can be passed through every 100 sq. ft. of filter-cloth in the press. At the end of a run lasting from two weeks to two months, the contents of the press are washed by pumping a little water, partially dried by blowing air through them and then removed; most of the cake falls out readily when the press is opened and the frames moved. At this stage the product usually carries about one-third its weight of water; its composition does not differ materially from that of zinc-shavings precipitate, and it may be refined in the same way. It is, however, more uniform owing to the absence of threads of 'short zinc.' The blowing operation oxidizes some of the undissolved zinc and sometimes causes the presses to become warm. During precipitation a certain amount of hydrogen is evolved, and its formation continues slowly, while the precipitate stands in a moist state. Care must, therefore, be taken to bring no naked lights near when inspecting valves, etc., at the time of the clean-up.

Zinc dust is shipped in drums and barrels holding from 800 to 1,600 lb. The price is lower than that of cut shavings and slightly higher than that of sheet zinc. It is not uniform in composition, but generally contains over 90% metallic zinc. The presence of a small percentage of lead has been found advantageous in effecting thorough precipitation. The fineness of division also varies, but in good samples over 95% will pass a screen of 200 mesh, while most of the particles are shown by the microscope to have a diameter not over 1-1,000 inch.

It has been shown that zinc does not accumulate in the solutions to any great extent, and that after a month or two the solutions do not change much in composition, even when used for several years. This is also true with zinc dust. The accompanying table shows the results obtained at some typical plants using zinc shavings and dust.

The result shows the zinc dust process to be as well adapted as the electrolytic to the precipitation of low-grade slime solution.

Some experiments were made on a solution carrying about $2.50 gold and $0.20 silver per ton, together with 0.015% copper and 0.05% free cyanide. One portion was treated with hydrogen sulphide until saturated; another was made distinctly acid

Material Treated at Plant.	Form of Zinc Used.	Aver. Strength Solution when Precipitated. Per cent KCN.	No. Tons Solution Precipitated by 1 Lb. of Zinc.	Percentage of Zinc Dissolved.	No. of Troy Ounces Precipitated by 1 lb. of Zinc.		
					Gold.	Silver.	Copper.
Sand, Gold and Silver	Shaving	0.32	1.5	84	0.31	0.56	.....
Slime, Gold and Silver	Shaving	0.04	5.	37	0.25	0.5	.....
Rich Gold Ore	Shaving	0.5	1.1	40	1.10	0.10	.....
Mixed Tailing, Gold	Shaving	0.1	3.3	60	0.70	0.01	Trace
Sand, Gold and Silver	Shaving	0.2	3.2	79	0.16	3.19	None
Mixed Tailing, Gold and Silver	Dust	0.1	2.	30	0.35	0.70	None
Low-Grade Sand, Gold	Dust	0.06	5.	84	0.76	0.30	.....
Mixed Tailing, Gold and Silver	Dust	0.08	3.5	60	0.31	2.08	0.75
Low-Grade Slime, Gold and Silver	Dust	0.033	5.	66	0.12	0.83	1.20

and then allowed to stand until the precipitate of silver and copper cyanide settled, when it was filtered. Other portions were electrolyzed. It was found that precipitation was far from complete unless the current was allowed to act for a long time, and unless the surface of the lead plates used was large in proportion to the volume of solution. When this was done all traces of the gold and silver and copper were removed. Other portions were agitated with zinc dust at the rate of ¼ lb. per ton, without filter-pressing, and others filter-pressed. The results were as follows:

Method of Precipitation.	Percentage of Contents Precipitated.		
	Gold.	Silver.	Copper.
Saturation with hydrogen sulphide	2	97	3
Acidulation	65	90	75
Electrolysis for 24 hours	100	100	100
Agitation 15 minutes with zinc dust	25	60	3
Agitation with zinc dust and filter-pressing	94	97	4

SIX MONTHS' EXPERIENCE WITH SIMILAR SOLUTIONS, USING ZINC DUST AND FILTER-PRESSING.

KCN. averaging 0.04 per cent	98 to 99	Over 96	2 to 4
KCN. from .08 to 0.1 per cent	98 to 99	Over 96	0.5 to 1

These figures bring out the fact that silver is, as a rule, easier to precipitate than gold, just as it is slower to dissolve in cyanide solutions. Thus in the case of a certain consignment a black deposit was always observed on the surface of the sand. This deposit for the most part redissolved in the course of a few hours. On examination it proved to be nearly pure silver sulphide, carrying a little gold and copper, while this particular brand of cyanide was found to contain an unusual proportion of alkaline sulphide. The trouble was prevented by using a purer brand of cyanide, or by precipitating the solution more frequently.

It is impossible to draw any general comparison between the merits of the different zinc and electrolytic methods of precipitation, but the following figures are based on practical results, with material of moderately low value, all being calculated to a standard of 100 tons solution precipitated per day. Electrolysis; precipitating tank of 1,200 cu. ft. capacity, say, a box 10 by 5 by 24 ft., having about 3,000 sq. ft. each of anode and cathode surface. This would require five or six horsepower to produce current, in addition to the power for pumping. The actual precipitation obtained at two plants averages very close to 90% of the value in solution.

Zinc shavings; 100 cu. ft. of capacity for the zinc, or about 175 gross cu. ft. of zinc boxes, say, two boxes 2 by 2 ft. by 9 in. by 16 ft., using 25 to 30 lb. of zinc per day, the only power required being for pumping the solution and turning the zinc. The actual precipitation obtained may be taken at 90 to 95% under favorable circumstances.

Zinc dust; one filter-press with 16 frames about 2 ft. square, working not over 15 or 16 hours per day, would require about two horsepower during that time (neglecting any additional friction in pumps) in excess of the power required for pumping solution from sumps in the last case. Some power is also needed for stirring or agitating solution when adding zinc, but this is only for a few minutes at a time. The percentage of precious metals precipitated at two plants ranges from 95 to over 98%, from 20 to 30 lb. zinc dust being used per 100 tons.

Owing to the greater cost of the machinery required for the electrolytic and zinc dust processes, it is evident that the zinc-shavings system is by far the best adapted to all small or temporary plants; but with installations intended to treat 100 tons or more per day, or likely to be in use for several years, the merits of the other systems should be considered.

Silicon copper is used as a cleansing and reducing flux for copper, brass and bronze.

The recent announcement of the definite accomplishment of the polarizing of the X-rays of Röntgen, by C. G. Barkla, scores another achievement. It means that the vibration of these rays is from side to side, as contrasted with the direction of transmission. In this respect the X-rays are a kind of light rays, and find the seat of their propagation in the luminiferous ether; but there is still much to be learned about the foamy scattered character they show, influenced and broken as they may be by the atoms or electrons of the substances traversed.

South African Methods.*

By Thos. H. Leggett.

There has been so much written regarding the character of the gold-bearing reefs of the Witwatersrand that it is not necessary for me to enter into any description of them. The Main Reef series, which is the payable formation, has been accurately located over a length of 47 miles roughly east and west along the strike, and it is safe to say there is not a square inch of ground in that distance that is not owned by some mining company. To my mind, it is a fortunate thing that the mining laws of the country are so simple. Each mining claim, which is in size about 155 by 413 ft., is bounded by vertical planes. There is no "elusive law of the apex," and in consequence there has been a total absence of mining litigation. In order to secure sufficient ground on the dip of the reef, one simply locates parallel claims on the dip; and this latter, I may remind you, is often as flat as 15 to 20°, while on the eastern flank of the Rand bore-holes have shown it to be as low as 6 to 8°. The application of this mining law has certainly been most satisfactory, and this in a country where the value of the mining claims has risen fabulously during the past ten years. For instance, claims lying on the dip of the reef, and where the latter lies at a vertical depth of over 5,000 ft., have been sold for $5,000 per claim, an area of a little less than 1½ acres.

As you know, the outcrop mines are nearly all worked by incline shafts, and only a few, those having an area of but a few claims, have as yet been worked out. Behind these outcrop mines—that is to say, southward on the dip of the reef—comes the first row of deep-level mines. On these there have been sunk 55 vertical shafts, the average depth to the reef being about 1,200 ft. There are in the neighborhood of 15 producing mines now at work in this row. In the second row of 'deep levels' the average depth to the reef of 22 shafts is 2,600 ft., but thus far there are only two or three of these properties that have reached the producing stage. The average depth of the shafts in the third row is about 4,500 ft., and I do not know of any property in this row that has yet reached the Main Reef series. There are mines in this third row of deep levels that will require shafts quite 5,000 ft. deep, but 4,000-ft. shafts are now getting to be quite common on the Rand. I may tell you that the usual deep shaft has four hoisting compartments, each 5 by 6 ft. inside timbers, and one pump and ladder-way of 6 by 6½ ft., although this is sometimes exceeded, as in my own experience, where the conditions permitted the working out of a single deep-level property of some 260 claims through a single 7-compartment

*Abstract from address given before the Thirteenth Annual Convention of the California Miners' Association, December, 1904. From advance proofs.

shaft. This shaft is now sinking to a depth of 4,000 ft., and has six hoisting compartments. The record for quick sinking is held by Mr. R. M. Catlin in the Howard deep-level shaft of the Consolidated Goldfields of South Africa, where he sunk 203 ft. in one month in a shaft 28 ft. 8 in. by 6. ft. inside timbers, and averaged 153 ft. per month for a period of 9 months, at a cost of about $80 to $90 per foot. In view of the deep mining now being done in the Lake Superior region, there has never been any doubt in the minds of the consulting engineers of the Rand that the mechanical problems connected therewith could be readily solved.

But the question has naturally arisen as to what depth mining would ultimately reach on the Rand. This touches closely upon the matter of the gold content of the reefs and their payability. With the object of endeavoring to form some idea of how much gold there was in the known mining area, I had the honor of collaborating, in 1902, with Dr. Frederick H. Hatch, in the preparation of an estimate of the gold production and life of the Main Reef series down to 6,000 ft. This does not mean that in our opinion the Rand reefs would be worked everywhere to a vertical depth of 6,000 ft., but as it was necessary to set some limit, and as it is evident that the reefs could be worked out to this depth without sinking a single vertical shaft of 6,000 ft. in depth, but by means of incline shafts at the bottom of the verticals from 4,500 to 5,000 ft. deep, we felt it safe to estimate the gold content to this limit. There is no doubt in my mind that the miners of the Rand will feel their way to these greater depths in the future just as they have done in the past.

The profitable yield from the first row of 'deep levels' encouraged the more strenuous development of the second row, the mines of which are now reaching the producing stage; and this, I take it, will be the case with the third and any successive row. My personal opinion is that beyond the third row of deep levels there will be very few vertical shafts, as it will be feasible to work out payable ground by long inclines from the bottoms of the shafts already projected and in course of sinking. One may naturally ask why this method has not been followed in the past and why so many deep-level companies were formed. The reason is simply a financial one—so long as the reef lay within readily workable depths, the quicker the gold was extracted the more profitable the operation of extracting it became. Therefore, it is only now when greater depths have been reached that a halt has been called in the formation of these companies that now lie rank upon rank, one above the other.

Dr. Hatch and I found that from the 47 miles of known reef there had been produced up to December 31, 1901, £76,762,291, and there remains to extract, to a depth of 6,000 ft., £1,233,560,709. The production of the Rand for 1898 was £15,141,000, and for 1899 it was at the rate of £19,000,000; the increase of production for the three years preceding the war being about £4,000,000 per annum. As you know, the recovery of the industry since the war has been extraordinarily slow. In 1903 the production was £12,589,000, and this year the production will be about £15,800,000. Before the war there were erected and in operation about 6,400 stamps, while today there are erected, and only awaiting the necessary labor to run, some 7,500 stamps, with many more stamps projected. The increase of stamping capacity in 1898 and 1899 was 2,195 stamps, or about 1,100 stamps each year; this rate of increase will, I think, soon be exceeded. Dr. Hatch and I estimated that in a few years the annual production of the Rand would reach £30,000,000 per annum; and I think, in view of the foregoing figures of the enormous stamping capacity, you will agree that this is a reasonable estimate. On the basis of this average annual production of £30,000,000 the life of the Rand would be about 42 years.

Such immense capital expenditures are rendered permissible by reason of the extreme regularity of the deposit. At the same time, it is nothing like as regular as is usually imagined. The reef series is intersected by innumerable dikes, which cut through the strata at all angles. It is faulted and thrown frequently, the throws sometimes amounting to a lateral displacement of hundreds of feet, while the sudden curving of the enclosing quartzitic sandstone, together with the capping of the later coal measures, has sometimes obliterated all trace of the reefs on the surface for distances of from one to two miles. Only by the most painstaking and persistent diamond-drill boring has it been possible to trace the payable reefs across the gaps. In consequence of these disturbances the underground work becomes troublesome and complicated.

To attain the maximum output, additional labor is necessary. The Rand has been much hampered through the lack of sufficient labor. Mr. H. H. Webb has shown that before the war there were about 107,000 Kaffirs employed in the Witwatersrand mines. The Transvaal Chamber of Mines reports that at the end of October, 1904, there were 71,661 natives at work and 12,968 Chinese. The shortage of Kaffir laborers, as compared with the pre-war days, is, therefore, very considerable, and is due to a multiplicity of causes which it is not necessary to enter into here. Perhaps the chief cause is the reluctance of the Kaffir to work, and the explanation of this lies in the fact that wherever nature is prodigal in the products of the soil, life is rendered so easy that the average native has no necessity to labor. It is stated on good authority that there are some 6,000,000 Kaffirs south of the Zambesi river, and yet it has always been difficult to get a sufficient complement of Kaffir laborers, not only for the mines, but for all industries in South Africa, and I presume this will always be so. The great need of labor has recently been met by the introduction of the Chinese, and as this step has brought forth much severe criticism from people who are not fully aware of the conditions that call for it, I think it may be well to explain them here.

First, I may say that the introduction of the Chinese into South Africa is not at all on all-fours with their introduction into America, Australia, or similar countries; and for this reason, that in the Transvaal there exist already two distinct classes of labor, namely, that performed by the white and that performed by the black. The presence of the Kaffir in such overwhelming numbers establishes this distinction, and nothing can change it. We all know that where white and black laborers come into contact there are certain things which the white man considers it *infra dig* to do, and the latter is most strenuous in maintaining this position. On the Rand, the Kaffirs do all the drilling in the stopes, running of cars, shoveling, etc., and on the surface the firing of the boilers, shoveling in the cyanide tanks and similar labor, while the white man does the bossing. This has been so ever since the mines started. Now, the Chinaman in entering that country is not put into competition with the white man, but is put upon the lower plane of labor which already exists there. He is employed only at Kaffirs' work. Recently enacted, and most strict, legislation has so safeguarded the white man in the Transvaal that there is not the slightest danger of the Chinaman ever going outside of his sphere of work. In America, and Australia, on the contrary, as soon as a Chinaman lands, he is at once in competition with all other classes of labor. It is evident, therefore, that one cannot reason from analogy and exclude the Chinaman from South Africa as he has been excluded in the countries named, since the conditions are entirely and fundamentally different. Although I have not been on the Rand since the introduction of the Chinese, I learn from reliable sources that they are turning out most excellent workmen, and mines that have had their stamps hung up for the past two years—and even longer—are now able to resume operations. As for their physical well-being, fellow-engineers inform me that they are being excellently taken care of; in fact, the danger is of erring too much in that direction. Hence, I think we can safely say that the introduction of the Chinese upon the Rand is a pronounced success. The coolies are obliged to be returned to China at the expense of the employing company at expiration of contract. I can assure you, gentlemen, that the situation in South Africa was desperate when this step of introducing Chinese was at last decided upon. Numbers of mines had in their treasuries working

capitals of from £100,000 to £250,000, and were unable to expend a penny of it for nearly two years, through lack of the required labor. If a condition of this kind confronted you here on the Pacific Coast, I am satisfied you would not theorize about it, but would speedily take action to meet it, and this is just what the people of the Rand have done.

In speaking of the working capital necessary for the development of the deep-level properties on the Rand, I am telling you nothing new when I say that the mines in the first row of deep levels have expended from two and a half to three million dollars each for development and equipment before getting out a single ounce of gold. But with a gold deposit of pebble-conglomerate lying in sedimentary strata and proven by boreholes to a depth of 4,880 ft., to say nothing of the hundreds of miles of workings now existing, this comprehensive policy of mine development has shown itself to have been not only well founded, but commercially successful. At the same time, like all policies, it has its limits and cannot be carried too far without inviting disaster; hence my remark that the miners of the Rand will undoubtedly "feel their way" in the exploitation of the greater depths before undertaking too heavy expenditures in deep shafts.

It is a well-known fact that the mines on the Rand have little water to contend with. It is fortunate that this is so, since the average yield of the 70 or 80 producing mines for the last few years has only been 41 shillings per ton, or, say, $10. It is evident that this grade of ore would not permit of the handling of large quantities of water from great depths. The one mine that has been afflicted with a heavy inflow of water is the Knights Deep, where they raise from 1,000,000 to 1,250,000 gal. water per day, from a depth of 1,200 ft. They pump this in a single lift by means of electrically driven high-speed Riedler pumps, of which they have three in their underground station, each with a capacity of 450,000 gal. per day. It may be interesting to note that during the dry season on the Rand the water from this mine has been sold at such a rate as to more than cover the cost of pumping.

But little timber is required in the underground workings; this also is favorable to deep mining. The hard quartzitic sandstone walls stand without either timber or filling, and only in a few cases have any heavy falls of rock occurred in the now extensive stopes. Prof. Agassiz, who visited the Rand in the early part of 1899, expressed the opinion that, after large areas of reef had been stoped out, or, say, in another five or ten years from now, extensive subsidence of the surface would take place, affecting the deep-level mines as well as the outcrop. Subsidences have already occurred in a couple of the outcrop mines, close to the surface, and perhaps greater ones may yet occur in the outcrop area. But it is safe to say that this will only happen toward the end of the lives of the outcrop properties, and they can be readily foreseen and guarded against in such a manner that no valuable property on the surface need be damaged. That the surface of the deep-level areas will be seriously affected is, in my opinion, very doubtful, since the caving that may take place in these sedimentary strata will occur in the shape of falls of successive layers of rock, which will speedily fill up the worked-out area and uphold the remaining ground.

The working costs before the war were from 27 to 28 shillings per ton, or, say, $6.75 to $7, while they are today about 2 to 3 shillings per ton less, or, say, $6.25 per ton. This, however, does not include the cost of obtaining Chinese laborers, which, I am given to understand, is high. At the same time, the margin of profit is such and the scale of working is so great that these mines on the Rand are today paying out in dividends fully 30% of their total output; in fact, I have no doubt that this year they will exceed this proportion as they did in '98, when the dividends paid were 32% of the total yield of £15,141,000, or nearly £5,000,000 paid out in dividends in one year.

Silicon in Iron.

By Daniel F. Morgan.

For iron containing from 6 to 11% silicon, dissolve 0.47 gram in 10 c.c. sulphuric acid (1 part acid to 3 parts water), and 15 c.c. of a saline solution (containing 120 grams sodium chloride, and 50 grams potassium chlorate dissolved in one liter of water). Evaporate to sulphuric-acid fumes, and continue heating for a minute or two after the fumes begin to appear. Cool; take up in hydrochloric acid (1 part acid and 1 part water), boil, filter, wash with hydrochloric acid and water; ignite and weigh.

The advantages of this method are, that spurting is rare, and that the silica is thrown down in a bulky mass which permits of easy burning of the carbon. By solution and evaporation in acid alone, the silica becomes very compact in the crucible and it is difficult to burn out the last trace of carbon. This compactness is more noticeable when the iron sample has been pulverized instead of drilled. The solution recommended in this method will not dissolve iron containing more than 11 or 12% silicon, so the silicon in such samples is determined by the following method:

Weigh 0.235 gram of sample, 2 grams cuprous chloride, and 1 gram ammonium chloride into a beaker; dissolve in 20 c.c. sulphuric acid (1 part acid to 3 parts water), 15 c.c. of the saline solution already mentioned, and 15 c.c. water. Evaporate to sulphuric-acid fumes, dissolve in dilute hydrochloric acid (1 part acid to 1 part water), boil and wash in the following manner: Decant the copper solution on to a filter, leaving as much of the silica as possible in the beaker. Place 2 grams of oxalic acid in the beaker, and add 50 c.c. dilute hydrochloric acid and boil. To the filter paper add a few crystals of oxalic acid, and wash with hydrochloric acid and water until free from copper. Filter the silica, which has been boiled with oxalic and hydrochloric acids, through the same filter, and again wash with oxalic acid, hydrochloric acid and water. Ignite and weigh. The weight obtained divided by 2 equals approximately the per cent silicon; but multiplying by decimal 0.467 gives the exact reduction. Following are some of the results which I have obtained:

	Method No. 1.	Method No. 2.	Method No. 3.	Method No. 4.
(1)	6.20%	.....	6.23%	.....
(2)	7.92%	.....	8.00%	.....
(3)	8.15%	.....	8.15%	.....
(4)	8.28%	.....	8.25%	.....
(5)	10.24%	.....	10.36%	.....
(6)	11.02%	.....	10.95%	.....
(7)	9.06%	.....	9.06%	.....
(8)	8.25%	.....	8.26%	.....
(9)	7.78%	.....	7.78%	.....
(10)	.....	16.26%	.....	16.30%
(11)	.....	15.27%	.....	15.28%
(12)	.....	13.48%	.....	13.53%

Method No. 1 is the first method which I have described. Method No. 2 is the second method which I have described. Method No. 3 consists in dissolving in 20 c.c. of a solution of 340 c.c. water, 100 c.c. sulphuric acid, 160 c.c. nitric acid, and 300 c.c. hydrochloric acid; evaporating to sulphuric-acid fumes, taking up in hydrochloric acid, filtering, washing in hydrochloric acid and water, igniting and weighing. Method No. 4 is the fusion method.

Iron Making in New York.—Chateaugay furnace, at Standish, N. Y., has been leased by the Northern Iron Company, of Port Henry, N. Y. Chateaugay furnace has been operated for some time by the Delaware & Hudson Company for the production of low-phosphorus pig iron, and has been taken over by the Northern Iron Company preparatory to more extensive operations. The plant is to be materially enlarged. A new stack is to be built to a height of 80 ft. A new modern Allis-Chalmers engine, now being built at Scranton, Pa., will be installed. A fourth stove is to be erected and other extensive alterations and improvements made, which will increase the capacity of the plant to 200 tons daily. When completed the furnace will be blown in for the manufacture of low-phosphorus pig iron, to be produced from Chateaugay ore. This ore analyzes 65% in metallic iron and in phosphorus 0.006, producing an iron with phosphorus and sulphur about 0.02%. A new plant is being installed at the Chateaugay mines to furnish a supply of ore for the furnace and for customers who are now using this ore for the production of low-phosphorus pig iron in other districts.

Eakins has shown that fine gold is slightly soluble in a strong solution of yellow ammonium sulphide.

New Assay-Furnace Tools.*

By Edward Keller.

The implements used in performing the furnace work in assaying are shown in Fig. 1. *A* and *B* are the traditional tongs, universally used for handling singly the scorifiers and the cupels. The former has been entirely replaced by a fork, *C*, with which a set of 20 scorifiers can be handled at one time. In silver assaying each set of scorifiers is placed in the muffle twice and taken out twice—first put in the muffle for the incineration of the filters, then taken out for the addition of the test-lead, then returned for scorification, and finally taken out for pouring the slag and molten lead into the molds. By the use of the fork, which works perfectly if the muffle be properly supported so that it will not sag to any marked extent, 60 handlings are reduced to three. Four scorifiers constituting a longitudinal row in the muffle are poured at one time by means of a pair of tongs, *D*, and with a little practice the pouring is made just as easy as with a single scorifier. It is necessary only that the mold correspond to the arrangement of the scorifiers and that the pockets are shallow. The cupels are placed into, or taken from, the muffle in sets of one or more rows, by means of the tools, *E*, *F* and *G*, an idea which, I believe, was first put into practice by my brother, Richard Keller, of Durango, Colo. *E* and *G* are sharp-edged shovels, the latter having up-turned sides. *F* is a rabble, with which the cupels are raked on to the shovel, and removed thence to the place where they are to be deposited by placing it behind them and withdrawing the shovel. The tool *H* and *I* is entirely new, and by its use one or more rows of cupels in the muffle may be charged with the lead-buttons from the scorifiers. Fig. 2 shows the idea of the device more clearly. It comprises a top sliding-plate with openings corresponding exactly to the position of the cupels. The openings in the lower plate correspond exactly with those of the upper one; the plate, however, rests on two adjacent sides extended downward at right angles to the plate and to each other, thus forming two closed sides of the instrument—one at the front and the other at the right-hand side. The height of these sides is such that, when resting on the bottom of the muffle, the bottom plate will be some distance above the cupels, and, by a slight pull forward and a push to the left with the handle of the instrument, the set of cupels will be perfectly aligned in both directions, and the apertures in the lower plate will exactly cover the tops of the cupels. The lead-buttons are placed in the apertures of the upper plate and rest on the lower plate before introducing the instrument into the furnace, and when it is placed over the cupels, which have been properly aligned in the muffle, the upper plate is pushed forward to a stop-point, bringing the apertures of the two plates to register, thus causing the lead-buttons to drop down into the cupels. The handle of the upper plate runs through guides fixed to the handle of the lower plate; both handles are connected by a spring, which acts as a brake when the upper plate is pushed forward to drop the buttons, and also serves to bring it back into its original position, in which the buttons cannot drop through the apertures in the lower plate.

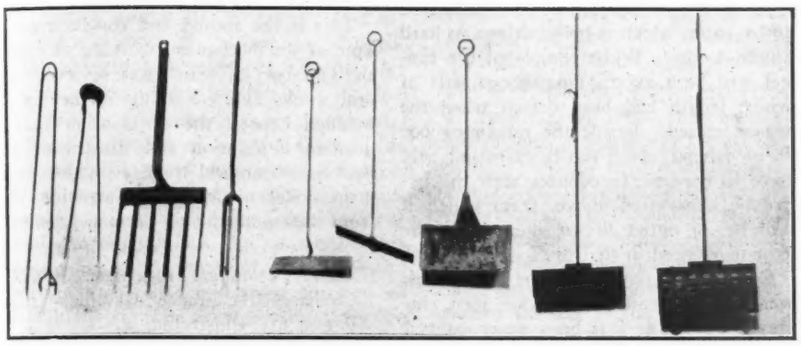


FIG. 1.

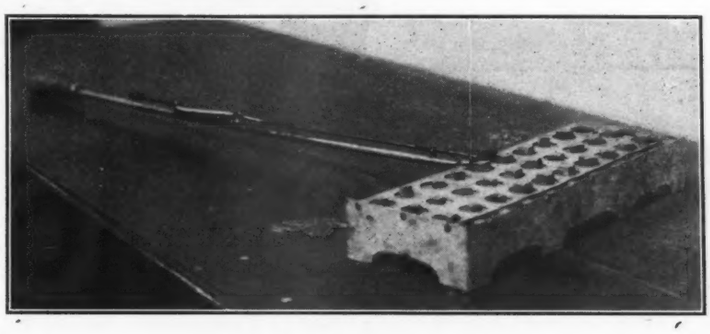


FIG. 2.

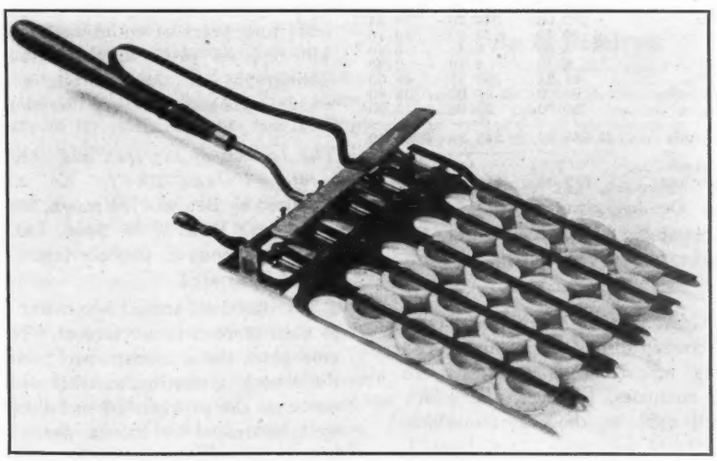


FIG. 3.

Charles Tookey[1] first recommended the use of hydrochloric acid (1 HCl.aq, 2 H_2O) instead of a brush for cleaning the buttons, and for this purpose a small silver dish and tray having perforated pockets give excellent satisfaction. By the use of this device 50 or more beads at a time can be treated, washed and dried without transfer.

I have recognized that the system of handling everything in sets was incomplete as long as I was unable to take a whole set (20) of scorifiers from the muffle and pour their contents simultaneously into the molds. Recently a tool for that purpose, shown in Fig. 3 and 4, has been perfected. It is composed of quintuple tongs, corresponding to the five longitu-

*Abstract from paper entitled 'Labor-Saving Appliances in the Works-Laboratory.' *Bulletin* No. 2, American Institute Mining Engineers, March, 1905.

[1] *Journal* of the Chemical Society, London, Vol. XXIII, 1870, p. 366.

dinal rows of scorifiers in the muffle. The lower part of each pair of the tongs consists of a fork, on which the scorifiers rest, and one of whose prongs is rectilinearly extended through two bearings in a frame, and held in position by collars. This extension is free to rotate in the bearings, and it is the axis of rotation of the tongs. To each of them is attached, at right angle, a lever, extending upward at an angle of 45°, and all the levers are connected by slotted joints to a cross-rod. Therefore, if by means of a crank, fastened to the end of one of the extended prongs, one of the forks is turned and the scorifiers tilted to the desired angle, the others perform the same rotation. The center of gravity of the scorifiers lies to one side of the rotation-point, and they would therefore, on being lifted, tilt in that direction; this, however, being prevented by the cross-bar

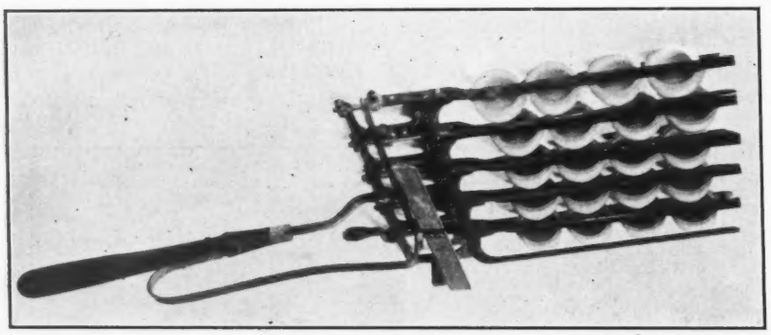


FIG. 4.

resting against a post at that end of the frame toward which the inclination tends.

The scorifiers are clutched by the upper prong of the tongs, which is fastened to a spring on a post of the fork below, and which is free to move in a vertical plane; the pivot, their other ends will rise from post. By bringing pressure on the extended ends of these clutch-bars behind the pivot, their other end, will rise from above the scorifiers, and thus release these, or permit the placing of them upon the tongs. The pressure exerted on the rear ends of the clutches is accomplished by means of a cross-bar fastened to a spring-bar, which is itself riveted to the handle of the instrument; all of which may be plainly discerned in the illustrations. In pouring the contents of the scorifiers, the frame of the tool rests on the edge of the mold, leaving the tongs free to turn.

According to the French weekly journal of science, the *Comptes Rendus*, the change in conductivity of metals under the influence of radium has been investigated by B. Sabat. Iron, steel, copper, brass, bismuth, german silver and platinum showed increase of resistance. The theory is that the beta-rays of the radium, impinging on the respective metals, were changed into heat, under which the conductivity diminished according to the ordinary heat law.

Low-Cost Tunneling with Electric Drills.

SPECIAL CORRESPONDENCE.

Some low-cost tunneling was done at the mines of the Consolidated Cariboo Hydraulic Mining Company, at Bullion, Cariboo, British Columbia, last season. This was in No. 1 sluice tunnel, dimensions 10 by 10 ft., which is being driven in hard augite-diorite. When completed the tunnel will be 1,200 ft. long, about half of which length had been driven when the season closed. Beside the remaining 600 ft. of driving, about 100 ft. of raising will have to be done to connect with the hydraulic excavation above, from which it will be an outlet to the dumps for the ground worked in that pit.

Costs during the earlier part of the work were higher than latterly, the men employed having at first been unaccustomed to the drills and the ground not so good for driving. The machines in use were two No. 15 Gardner drills, driven by 2-h.p. electric motors. Costs from Sept. 5 to Nov. 17, inclusive, working two 8-hour shifts, were as follows:

	September.	October.	November.
Labor	$936.00	$1,153.50	$645.25
Powder	389.00	316.80	150.24
Fuse	15.59	27.72	29.10
Caps	5.00	8.50	5.60
Candles	8.10	8.10	6.35
Sundries	41.23	268.77	49.05
Blacksmith	91.00	40.00	35.00
Stable	50.00	25.00	15.00
Totals	$1,535.92	$1,848.39	$935.59
Feet driven	127½	174	92½
Cost per foot	$12.05	$10.62	$10.11

The October costs include $209.58 for two Stowe flexible shafts, the life of which should extend over about six months.

In Great Britain, Belgium and Germany an increased disposition to introduce coal-mining machinery is manifest. In all these countries, however, the mines are actively opposing the use of machines.

Although Belgium is one of the oldest coal-mining countries, and its collieries have been actively worked for many years, a new coal region has just been discovered. Borings in the Campines field have shown the existence of coal, and mining will soon be begun. The area of the new field is large

Books Reviewed.

Lehrbuch der Mechanisch-Metallurgischen Technologie. By A. Ledebur. Second Part. Brunswick, Germany; Friedrich Vieweg & Sohn. Pages, 424; illustrated. Price (in New York), $4.25.

This is the second and concluding volume of the mechanical working of metals, the first part of which was reviewed several weeks ago. Nothing further is demanded beyond the observation that in detailed description and illustration this book is a standard treatise on the metallurgical technique of the machine shop from the standpoint of German practice.

L'Année Technique. 1903-1904. By A. Da Cunha. Paris, France; Gauthier-Villars. Pages, 303; illustrated.

This well-printed and well-illustrated volume is the annual summary of scientific progress, along the lines of locomotion on land and sea, physical experimentation, architecture, lighting and heating, and physiology. It is a technico-popular but readable treatise, and bears good testimonial in the shape of a preface by Henri Moissan, which is a voucher to the high-grade quality of the varied and fascinating information enpaged therein.

Geological Survey of Ohio. Bulletin No. 3. Fourth Series. The Manufacture of Hydraulic Cements. By Albert Victor Bleininger. Columbus, Ohio; published by the Survey. Pages, 392; illustrated.

This is bulletin No. 3 of a series several numbers of which have already been reviewed. The chemistry, physics, manufacture and testing of hydraulic cements comprise the substance of this volume. It is from the pen of the instructor of ceramics in Ohio State University, and represents four years of enthusiastic labor. It will find its place in the authoritative bibliography of this subject, a subject which is growing in every direction.

The Journal of the Iron and Steel Institute. Volume LXVI. No. 2. 1904. Edited by Bennet H. Brough, Secretary. London; E. & F. N. Spon, Ltd. New York; Spon & Chamberlain. Pages, 712; illustrated.

This standard annual is too well known to need more than a comment. This volume gives the administrative business of the American meeting, together with many notes on the progress of metallurgy, and well buttressed by half a dozen special papers; among the latter should be mentioned that by H. H. Campbell 'On the Influence of Carbon, Phosphorus, Manganese and Sulphur on the Tensile Strength of Open-hearth Steel'; and that by J. Gayley 'On the Application of Dry-air Blast to the Manufacture of Iron.' The volume is opened with a fine half-tone of the late Sir Lowthian Bell. Last and

best of all, an index of 33 pages serves to rescue the contents from the obscurity of neglect, by making it a ready reference manual of metallurgical progress.

United States Geological Survey. Bulletin No. 252. Preliminary Report on the Geology and Water Resources of Central Oregon. By Israel C. Russell. Washington; Government Printing Office. Pages, 138; illustrated.

This is a preliminary report on the geological structure of central Oregon, as affecting the water supply and drainage. It is well illustrated, is provided with maps, and has an index. Lakes Malheur and Harney are in the center of this region, usually associated in one's mind as the home of the tertiary eruption of basaltic lava. The average rainfall for the region is about 8 in.; but the mountains supply a few streams that could be profitably used in irrigation.

Die Electrometallurgy der Alkali-Metalle. By H. Becker. Halle-a-S., Germany; Wilhelm Knapp. Pages, 135.

This treatise by the editor of *L'Industrie Electro-Chemique,* of Paris, is Volume IX of the series of monographs on Applied Electro-Chemistry, published by Wilhelm Knapp, of Halle, and edited in general by Viktor Engelhardt, the chemical engineer of Siemens & Halske. It is a readable monograph on the chemical and electro-chemical metallurgy of sodium, lithium and potassium, from the standpoint of the practical. The index covers the names, but unfortunately not the subject matter.

Aequivalentvolumen und Atomgewicht. By W. Borchers. Halle-a-S., Germany; Wilhelm Knapp. Pages, 17.

A short paper on the relations of the atomic volumes and the atomic weight of the chemists, as considered in respect to the periodic sequence. An incidental contribution to a large subject. The author finds room for many elements still missing or unrecognized.

Cement and Concrete. By Louis Carlton Sabin. New York; The McGraw Publishing Company. Pages, 520. Price, $5.

The use of cement in construction has been growing so fast that practice in this direction has advanced more quickly than the record of results. The consequence is a demand for information; new data and results of investigation are in demand. The present book is based largely upon some important work with cement, and is a valuable contribution to the literature on the subject. It is divided into four parts, Part I treating of the classification and manufacture of cement; Part II of the properties and methods of testing; Part III of the preparation and properties of mortar and concrete; Part IV of the uses of mortar and concrete. Cement is coming into use to a considerable degree in mining and in mill construction, so that the mining engineer will appreciate the information given in this volume, as well as the civil engineer and constructor.

The Mechanical Engineering of Collieries. Volume I. By T. Campbell Futers. London, England; The Colliery Guardian Company, Ltd. Pages, 136; illustrated. Price (in New York), $2.50.

In recent years there have been great improvements in machinery for use in coal mines. There has been a tendency to increase productive capacity by the use of larger shafts, better hoisting machinery, larger pumps and other appliances; to eliminate labor as much as possible; and to economize in the use of fuel. All this has required the aid of the mechanical engineer, as well as that of the mining engineer; and has also made obsolete many of the old text-books on coal mining. The present work, only the first part of which has been issued, is a reprint of a series of articles published in the *Colliery Guardian* of London. While written especially for British engineers, it is an excellent text-book for colliery engineers everywhere. The first part includes four chapters which relate, respectively, to 'Boring,' 'Shaft Sinking,' 'Surface Arrangements' and to 'Shafts and Headgear.' Each subject is carefully treated, illustrated by examples of recent practice, and accompanied by many engravings. The author admits that there are still unsolved problems in coal-mining practice, such as safety appliances and economical hoisting from deep shafts. To work these out will require time and constant development, as well as the careful study of past work, to which the present book will be a useful aid.

Books Received.

In sending books for notices, will publishers, for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

Transactions of the American Electrochemical Society. Volume VI. 1904. S. S. Sadtler, Secretary. Philadelphia; published by the Society. Pages, 200; illustrated.

Project for the Panama Canal. By Linden W. Bates. New York; published by the Author. Pages, 38; with maps and profiles.

Fabrication de l'Acier. By H. Noble. Paris, France; Veuve Ch. Dunod. Pages, 616; illustrated. Price (in New York), Paper, $8.75; Bound, $9.25.

Inhalts-Verzeichnis zum 31-40 Jahrgang der Berg- und Hüttenmännischen Zeitschrift "Glückauf." Essen, Germany; published by Glückauf. Pages, 116.

American Telephone Practice. Fourth Edition. By Kempster B. Miller. New York; The McGraw Publishing Company. Pages, 904; illustrated. Price, $4.

The Italian in America. By Eliot Lord, John J. D. Trenor and Samuel J. Barrows. New York; B. F. Buck & Company. Pages, 276; illustrated. Price, $1.50.

Geologic Atlas of the United States, No 119. Fayetteville Folio, Arkansas, Missouri. Washington; engraved and printed by the Geological Survey. Two maps, and 8 pages text.

Bureau of the Census. Special Reports. Street and Electric Railroads, 1902. Prepared under supervision of W. M. Steuart. Washington; Government Printing Office. Pages, 440.

International Exposition, St. Louis, 1904. Official Catalogue of the Exhibition of the German Empire. Edited by the Imperial Commissioner. Berlin, Germany; Georg Stilke. Pages, 540; with map and illuminations.

United States Geological Survey. Water Supply and Irrigation Paper No. 117. The Lignite of North Dakota and its Relation to Irrigation. By F. A. Wilder. Washington; Government Printing Office. Pages, 60; illustrated.

A Report on the Labor Disturbances in the State of Colorado, from 1880 to 1894, inclusive. Prepared under the direction of Carroll D. Wright, Commissioner of Labor. Washington; Government Printing Office. Pages, 368.

United States Geological Survey. Professional Paper No. 39. Forest Conditions in the Gila Forest Reserve, New Mexico. By Theodore F. Rixon. Washington; Government Printing Office. Pages, 92; with maps and diagrams.

The Berlin-Zossen Electric Railway Tests of 1903. Translated from the Official Report by Franz Welz. With *Introduction* by Louis Bell. New York; The McGraw Publishing Company. Pages, 74; with illustrations and 38 full-page diagrams. Price, $3.

A Treatise on Concrete, Plain and Reinforced. By Frederick W. Taylor and Sanford E. Thompson. With Chapters by R. Feret, W. B. Fuller and Spencer B. Newberry. New York; John Wiley & Sons. London; Chapman & Hall, Ltd. Pages, 620; illustrated. Price, $5.

COPPER SULPHATE, AN ALGICIDE.—Experiments by the United States Department of Agriculture show that the quantities of copper sulphate required to destroy algæ present in water are much less than supposed. The ratio of copper sulphate to water for the purposes of purification varies from 1 to 100,000 gal. to 1 to 25,000,000 gal., according to the resistance of the particular form of bacteria present. Evidently the consumption of copper sulphate in this direction promises expansion.

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Illinois Coal Mine Explosions.

Sir—The recent explosion in the Leiter coal mines at Ziegler, in Illinois, adds another—and a most disastrous one—to the list of accidents in the mines of that State. I recently called attention, in your columns, to the frequency of these accidents, and the need of searching investigation. In this case, so far as we can tell at present, the cause was an explosion of gas, possibly helped on by the careless storage of a quantity of explosives in the mine. The theory put out by some newspaper despatches, that the explosion was purposely caused by striking union miners, ought not to be entertained for a moment. It is probable that the real cause is to be found in carelessness or ignorance of miners, and their use of lights. This supposition is supported by the statement in the despatches that most of the men killed were "Greeks and Lithuanians, recently employed, whose names were not known, as they were distinguished by numbers." Just the men to use naked lights, or strike matches, in a fiery mine, regardless—or ignorant—of consequences.

Whatever the cause, I say we must investigate. To appreciate causes is the first step to betterment.

MINE OPERATOR.

Columbus, O., April 14, 1905.

Traveling in Sonora.

Sir—There has been considerable discussion lately concerning the situation in Sonora, but almost without exception the various opinions have been expressed by strangers or transients. The writer has been carrying on mining and prospecting operations in the center of the zone of disturbance for over a year, and desires to state the condition of affairs as they really exist, in their bearing upon mining investments in this State.

First of all, it should be clearly understood that the scene of the Yaqui depredations is confined to a small part of Sonora, mainly to the south-central portion. Business is carried on at the mines just about the same as if the renegade Yaquis did not exist. Contrary to Mr. Malcolmson's opinion, the Indian trouble does interfere with ranching and farming, as dozens of lately deserted ranches attest. The Indians generally roam in bands of 10 to 20, but sometimes form larger bodies; then the loss in horses, burros and cattle is large, as they prefer horse-meat to that of cattle. Whenever Americans travel without an escort of soldiers they alone are to blame, as the military authorities insist upon foreigners traveling with escort. Strangers are frequently very unjust in their accusations. They arrive without notice at some small station, and because they are asked to wait until an escort can be arranged for, they become angry and generally leave without it. The writer knows of several cases where foreigners have left in their carriages without an escort, contrary to the expressed command of the governor or the general in command. By order of General Torres and General Peinado, my carriage is never allowed to leave camp without an escort of 15 armed men. All that is necessary to do is to inform the president of the *municipalidad* of San Marcial, and on the day specified the escort will be waiting. This expense is borne entirely by San Marcial, and does not cost the foreigner one cent. In the same manner freight is guarded either by *federales* or *nacionales*, and I do not know of one life being lost or any merchandise being stolen during the past year when so guarded.

I am constantly making horseback trips through the troubled section, and although I know that there are a great many small bands of bad Indians I have never been molested, and do not expect to be attacked. These trips are from 40 to 150 miles, and consume from one day to one week, and are generally made with either one or two *mozos*.

If for any reason the traveler does not have a regular military escort, he should have a led saddled horse along, and should ride through any specially dangerous part, the remainder of the journey being taken in the carriage. A paid escort does not amount to much, as they are liable to break at the first volley and leave the foreigner, in whom they have only a pecuniary interest, alone in the carriage, a splendidly helpless target. Travelers should use ordinary common-sense precautions, such as would be observed in the low part of a city. For instance, the only three Americans killed in this region during the last two years were murdered for the sake of robbery. Mr. Martin and Mr. Garrett, of La Barranca mine, were killed because it was known that they carried the money to pay off the workmen at the mines. Mr. Sullivan, killed near Suaqui Grande, always wore considerable jewelry and was known to carry a large amount of money. Travelers should therefore dress plainly, and have their money so arranged that it will not be necessary to pull out a roll of bills on all occasions. The exact date, destination and hour of departure should not be made known to everyone beforehand. In fact, it is better, now and then, to give a wrong destination and apparently change the mind at the last minute.

Surely it cannot be considered inimical to investment when only seven foreigners have been killed in over two years, and, as far as known, through inadvisable show or carelessness. There are a number of prospectors working alone, sometimes when the Indians are known to be less than half a mile from the prospects, and of necessity within hearing of the blasting, yet not one of them has ever been bothered. One source of immunity adopted by me is to employ no Manso Indians, though they are cheaper and better workmen than the ordinary Mexican laborer.

PATROL IN THE YAQUI COUNTRY.

A. T. T.

Ortiz, Sonora, Mexico, March 29, 1905.

GOLD MINING IN URUGUAY.—The gold mine at Cuñaperu in Uruguay, which is operated by a French company, is leased from the state, at a royalty of 0.5% of the gross output. In the six months ending Dec. 31, 1904, the total yield of the mine was 9,058 tons of ore, from which 29.77 kg. of bullion, valued at $12,684, was obtained. This bullion was equal to 19.09 kg., or 613.7 oz., fine gold. This yield was very low, only averaging $1.40 per ton of ore.

One difficulty in adapting the osmium and tantalum lamps to commercial necessity has been in raising them to the standard 110 voltage of most circuits. Now that this has been accomplished, we may expect to see these lamps in practical use.